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TARIFF ON COTTON MANUFACTURES.

Manufacturing breeds a community of believers in a customs tariff for the protection of the industry against that existing in foreign countries. A protective tariff means simply the home market for the home industry, to the exclusion of foreign competition at valuations that will militate against a high standard of living and civilization among the great masses of the people.

The cotton manufacturers of the South do not feel the necessity of a protective tariff as do the cotton manufacturers of fine goods in the North, or the woolen manufacturers of the country, yet, while they may not feel or appreciate it, the necessity of an adequate protection of the industry as a whole is none the less indispensable for the maintenance and profitableness of its several parts. Taken by itself, the manufacture of the coarser and ordinary grades of cotton products stands in little need of protection against similar foreign products in competition for the world's trade, yet when this competition is successfully met it is found to be chiefly due to the superior or intrinsic merits of the American fabric for which a correspondingly higher price is willingly paid. The reason why we do not have a larger foreign trade in cotton goods is other than that pertaining to the cost of manufacture, though the latter is a no small factor when the question of a tariff on imports is considered for maintaining the industry on a profitable basis and giving it the domestic market which is the best to be found in the world, and which foreigners would be more than glad to get to themselves if they could.

A VAGUE PROPOSITION.

As the Southern cotton manufacturing industry goes higher in the scale of goods made, the stronger becomes the sentiment for a tariff on foreign imports, and where this sentiment is not already crystallized is among those who have not yet risen above the making of the coarser class of manufactures that require none but the cheapest and most unskilled labor to produce. To such people, the question of a tariff as an important factor in the development of the cotton manufacturing industry of the South is a vague proposition with obscure proportions. It is pitiable, that some men, otherwise possessing good business discernment, are apparently unable to see beyond their own immediate horizons for influences that may have direct and vital relation to their own welfare and very existence.

COARSE GOODS ARE BENEFITED BY A TARIFF ON FINE GOODS.

A protective tariff on foreign goods of the finer class of cotton manufacture, upon which it is of recognized importance is, in a measure, equally effective in sustaining the coarser class of manufacture. This, we regret to say, is not seen by every one engaged in the production of the latter class of goods, due more largely to indifference than to anything else. This limitation of economic observation is particularly deplorable, at this time, because of the efforts and aspirations of the Southern industry to lift itself on to a higher plain of manufacture that will greatly increase the value of its products and bring into demand a more skillful and a more intelligent class of work people, that

will reflect its benefits upon the community in which it may reside.

The manufacturer of coarse goods is just as much concerned in a protective tariff on fine goods as is the manufacturer of the latter, and he should extend his active and moral support to the efforts that are being made to preserve the protective features pertaining to the tariff on fine goods as thoroughly as though he were a direct beneficiary himself. To do so he should be a believer, if not a devotee, in the principles of protection to American industries so far as this may be consummated by a tariff on foreign imports, leaving to home competition the regulation of prices to consumers. This regulating influence might as well come, as it is more patriotic, from an active home competition for home benefit, as from an aggressive outside source which has no interest whatever in the welfare of our people more than the profits it can take for its own emolument for foreign distribution. In these days of enlightenment, no one at all conversant with the advantages of commercial intercourse among nations and people, believe in a prohibitive tariff against trade in foreign commodities. But while a liberal policy should be inaugurated and carried out in this respect, at least an equally consistent policy should be applied to the encouragement of domestic industry and commerce through some system of protection that is promoted by legal enactments.

Were it not for a tariff protection against foreign manufactures of fine goods, the production of this class of goods could not be carried on in this country, and, if this were the case, the mills now on fine goods would be obliged to go on to the coarser ones, and thus come into competition with the latter to the great detriment of all concerned. Therefore, manufacturers of coarse goods, however indirectly, are as vitally concerned in an adequate tariff on fine goods as are the manufacturers of the latter, and to this extent they can not afford to be indifferent to what is being done in securing legislative recognition of this fact.

DIVERSIFICATION OF PRODUCT.

The salvation of the cotton manufacturing industry of this country is diversification of product, so that it shall not be all of one kind, coarse or fine, plain or fancy, and if a customs tariff is essential to effect this there should be no sentiment antagonistic to it, but rather one that is fervent in its behalf. The coarse goods mills of the South should be kept in profitable motion, but there is one thing sure, they can not be unless the fine goods mills of the country are also profitably employed. This is a point that should not be forgotten or overlooked, yet intercourse among those who should be interested reveal a deplorable ignorance of its vital importance, and a lack of opinion of the significance of any tariff that would be instrumental in effecting this condition of correlative dependence. The coarse goods mills should not delude themselves into a belief that they are not dependent on a domestic market free from any foreign competition, and that they can enter into a foreign trade, at will, on equally advantageous terms, for such they can not do. If they will only study the situation in its true light, they will reach the inevitable conclusion that they stand in need of the uplifting influence of the fine goods mills, and that the existence of the latter is necessary for their own conservation.

AN AMERICAN MARKET FOR COARSE GOODS.

The present tariff on imports is sufficient to give the American market to American manufactures, as was the intent of the law, and the great class of consumers have not been the losers by this form of partnership between capital invested in manufactures and themselves. If an estimate should be ventured of the proportion of fine fabrics made in the United States out of the total manufactured, we would place it at approximately one-tenth in value. Nine-tenths of the value of woven cloth made in this country represents coarse and medium grades, and 30 per cent. of this, or $110,000,000, may be taken as the value of that which could be diverted into the channels of an export trade. We note, however, that only an average of about one-fourth of this amount of goods was annually exported during the last three years, leaving three-fourths for a domestic demand; thus showing the pre-eminence of the home market which foreign manufacturers are striving to get possession of. The latter are already in possession of a substantial trade in this country, but chiefly in a class of goods that our American mills have not taken hold of, costing, in plain weaves, 20 cents and above per square yard, characterized, it may be, by some special finish.

A comparatively large importation of the expensive fabrics, woven or otherwise made, does not necessarily imply an inadequate tariff, but may indicate an improved financial condition of the buying class whose means allow a more elaborate gratification of esthetic wants. The tariff, as it stands to-day, is in its general features, a good protective measure, and a no better indication of it can be had than in the fact that not more than 15 or 18 per cent. of the value of cotton goods consumed by the American people consists of those manufactured by foreign hands and implements. The schedule pertaining to the manufactures of cotton may need some slight re-adjustments in the way of rates and classification, which it will undoubtedly receive, but, structurally, it is good for another period of tariff existence.

TARIFF ON MANUFACTURES OF WOOL.

The most intricate schedule in the customs tariff law is that pertaining to wool, its by-products, and its manufactures. Its provisions are paramount to those in the other textile schedules, in case there is any conflict or anything that leads to interference in interpretation affecting classification and rates of duty. Any article of merchandise that has wool as one of its constituents is at once relegated to the schedule on "wool and manufactures of wool," and there subject to the highest rates of duty imposed on any class of textiles. For example, manufactures of silk pay an average import duty, reduced to an ad valorem basis, of about 53 per cent.; manufactures of cotton, 54 per cent.; manufactures of flax and those related thereto, 38 per cent.; while manufactures of wool pay 90 per cent. The rates on flax and wool, however, are modified by the duties on the raw materials, which average 11 per cent. in the case of the former and 45 per cent. in the case of the latter, reckoned ad valorem. The manufactures of silk and cotton are not afflicted with any import tax on their raw material, and in this respect are more favorably situated than those of flax or wool. Eliminating, therefore, any duty on the raw material that must be accounted for and borne by the manufactured article, it appears that the latter, in and of itself, pays an average duty of approximating 53 per cent. for silk, 54 per cent. for cotton, 27 per cent. for flax, and 45 per cent. for wool. Taking the textile industries in the latter point of view, standing alone and isolated from any burden they may bear from an import tax on their raw ma-

terial, and it will be seen that the woolen industry is not, comparatively, excessively protected by a customs tariff, and that both the silk and cotton industries are more highly favored in this respect. The foregoing ad valorem rates are easily verified and readily accessible from custom house returns as published by the U. S. government.

BLOOD CLASSIFICATION OF WOOL.

Wool occupies an anomalous position in the tariff. Other fibers are not distinguished by any order of breeding, growth or physical characteristics. Wool, however, is classified, and pays a duty accordingly, in comformity to "blood," or to the breed of the animal upon which it is grown. This innovation was first incorporated in the tariff act of 1867, and has been adhered to in its essential features in all subsequent acts, though somewhat modified in the 1897 act by raising the classification of some wools, distinct from blood, that had previously come into our ports at a lower rate of duty.

For tariff purposes, wools are divided into three classes according to blood characteristics with a collateral regard to use in manufacture. Class one wool is that which has an infusion of merino blood, chiefly, and some other growths that assimilate with it. It is this class that is the most disturbing factor in the establishment of an equilibrium between a duty on wool and the manufactured article, because it is not only the principal kind raised in this country, but the one that is used for practically all of our domestic fabrics, other than for carpets and the like. The wool growers, therefore, are especially concerned in this description of wool and are particularly solicitous how it appears in the tariff. Last year 68,000,000 pounds of it were imported, or nearly 47 per cent. of the total amount of wool imported, or more than 94 per cent. of that entering into goods other than carpets, and subject to a duty of eleven cents a pound if in an unwashed condition.

CROSSBRED WOOL.

Class two wool is confined to that which is taken from the mutton breeds of English sheep, and can not be worked to good advantage only by the combing process, because of its extra length of staple. This wool, however, goes into the first class should it be bred in anyway with the merino, and when this occurs it is denominated in the trade as "crossbred" wool, which is largely imported and thus swells the statistics of imports of class one or the merino infused wools. These crossbred wools are predominating the wool production of the world for manufacture into fabrics for men's and women's wear. They are not suitable for the very finest grades of goods, as broadcloths and the better quality of face finished fabrics, but they are made into the great bulk of cloth, mostly worsted, that is converted into garments of all kinds, and furnish the basis of a very durable and nice appearing article of clothing.

CARPET WOOL.

Class three wool is that which has not been improved by an infusion of merino or English blood. It is the native wool of Asia and Russia, for example, though there is imported not a little of that grown in Great Britain, for the latter produces some native blooded wools. This class of wool is enumerated in custom house statistics as for carpets, and while this may designate its chief use, it is not wholly employed for these goods, and some of the best grades are sometimes or can be utilized in the manufacture of woolens of a coarse quality as may be observed in cheviot cloth and the like.

AN OPERATIVE SCHEDULE.

The wool and the manufacture of wool sections of the tariff have been made to articulate into each other with consummate skill and ingenuity, as the result of a long and consistent study on the part of some of the brightest and most adroit manufacturers and wool growers the country ever had. The schedule, in its structural features of to-day, was a creature of the 1867 tariff, and was brought into being by the best intellects of that period. It has been modified and improved with the changes in the production and manufacture of the staple, but its main structure, or frame work, has stood with no probability of its being changed in the coming revision of the law. As it stands to-day, whatever may be said in criticism of the wisdom of some of its parts and of minor inconsistencies, it, at least, is well jointed for the purposes for which it was intended of protecting the general industry from foreign competition or aggression. It has well and satisfactorily answered the object of those financially concerned in the success of its provisions.

SPECIFIC RATE OF DUTY.

As we have already stated, most of our imports of wool consist of class one, or the merino type, upon which there is imposed a specific duty of eleven cents a pound. This form of duty, in preference to an ad valorem, has long been agreed upon by those pecuniarily interested as the best under all circumstances, though our own belief is that this preference has been over estimated in its benefits. While this is protective to the grower of domestic wool, or, at least, gives him a material advantage over his foreign competitor, it is, nevertheless, a tax on the one who manufactures the staple into goods. In order to counterbalance this tax, a so-called compensatory duty of so much per pound on the manufactured product is provided to the extent of three to four times that on the raw material in its unwashed condition, that is, as it comes from the sheep's back with all the natural grease or extraneous matter in it. This compensating duty is generally four times eleven cents, or forty-four cents per pound of cloth, and this is taken to be understood in any general allusion to this feature of the tariff.

COMPENSATORY DUTY.

The compensatory duty of forty-four cents a pound of cloth has been severely criticised and adversely commented upon as being more than justified by the conditions affecting the waste or shrinkage in wool during the process of cleansing it ready for manufacture. These comments are based on a false idea of the underlying purpose of the protective features of the tariff relating to the manufactures of wool. The tariff on these manufactures is specifically intended to be of a character and sufficient to safeguard our manufactures against those of the most favored foreign countries, in regard to the raw material as well as to the items that enter into the cost of manufacturing. In calculating the proper rate of duty on any article of import, so that it shall be protective to the domestic article, the most adverse conditions must be taken into account, otherwise these conditions will assert themselves to plague the industry that it is intended to protect. This is the only practical way to look at it regardless of what actually takes place.

It has been asserted by those who condemn the duty of forty-four cents a pound on imported manufactures of wool that this duty is excessive and unwarranted, and support their contention by examples of imports of low-shrinkage wool of which it does not take four pounds to make one

pound of cloth. Under present practice it is an admitted fact that it does not take four pounds of wool to make a pound of cloth, and the saving effected in this particular is an advantage to the manufacturer, and to this extent the compensatory duty is actually more than compensatory, and serves as an additional protection to the ad valorem rate that is imposed. But this saving is consummated by forcing, so to speak, upon American manufacturers the purchasing of foreign wool of the very lightest shrinkage at a relatively high price compared with that at which their foreign competitors can secure theirs. In other words, the duty on wool restricts the American manufacturer to a very limited selection in his foreign purchases, and to this extent is handicapped.

The duty on merino, or class one, wool is placed at eleven cents on the unwashed pound. Whether this is too high or too low is not a question in point, nor is the relative condition in which the domestic and foreign article is marketed. Unwashed merino fleece wool, whether grown in the states of New York, Ohio, West Virginia, or Montana, for instance, or in Australia, will lose in cleansing an average of 66⅔ per cent. of its weight, or, in other words, it gives one pound of clean wool fit for manufacturing for every three pounds as it is sheared from the sheep's back, unwashed. Thus from 100 pounds of unwashed wool, 33⅓ pounds of clean wool is obtained. Now it is a moderate estimate in placing the production of woven cloth from this amount of clean wool at 25 pounds. Such being the case it is readily seen that it is proper to reckon one pound of cloth to four pounds of wool, and the reason why this is so calculated in the tariff. In framing a protective tariff these issues must be considered in their broad and possible application, and while the rates of duty should be regulated by facts as they are found in trade, they should also be considered in the light of possibilities. All of these statements can be substantiated by mathematical demonstration, or concrete examples, but space will not allow us to take up this phase at this time.

DUTY ON TOPS.

While on this part of the wool tariff, we desire to simply allude to that semi-manufactured product in the manufacture of worsted yarn known in the trade as a "top," which has been a subject of no little animadversion because it was supposed to have been surreptitiously incorporated into the tariff act of 1897 by manufacturers of worsted or their spokesmen, at an extraordinarily high rate of duty wholly out of proportion to the needs of the industry. This product is not mentioned, eo nomine, in the act, but it is nevertheless there at a rate of duty fully as high as that applied to a completed manufacture, while yarns are subject to a lower duty, and "tops," by rights, should be subject even to a still lower duty. This classification was a mistake, but, as a matter of our personal knowledge, it was not at the request of manufacturers but at the instigation of wool growers under the leadership of Judge William Lawrence, whose efforts in this direction is a matter of printed record. Yet, as a question of fact, it is of no practical importance whether tops are subject to 44 cents a pound and 50 per cent. ad valorem duty (the same as cloth), or 25 cents a pound and 40 per cent. ad valorem duty (less than on yarn), as either one of these duties would keep out of our ports the foreign stuff. A counterpart of what Judge Lawrence did in regard to tops, to the popular, though undeserved, discredit of manufacturers, has been re-enacted by Gen. C. H. Grosvenor, of Ohio, who recently appeared before the congressional committee on ways and means, in the name of the wool growers, in denunciation of the now proposed intention of putting tops at a lower rate of duty, at the suggestion of manufacturers, and thus "permit the continuous (?) importation of a brazen foreign import competing with the domestic mutton sheep." Perhaps Gen. Grosvenor had some idea of what he was talking about, but it looks to us as though he was "talking through his hat." There has been no importation of tops for the last eleven or more years, and had there been such it would be difficult to understand what connection there could be established between this product and mutton sheep.

TEXTILE MACHINERY EXHIBIT IN BOSTON.

The Textile Exhibitors' Association, with an office at No. 5, Park Square, Boston, Mass., Chester I. Campbell, manager,—is preparing the numerous details in connection with the forthcoming exhibition to be held in Mechanics Building, in that city, from April 26th to May 1st, in connection with the annual convention of the National Association of Cotton Manufacturers.

A flat rental for space has been adopted. The price agreed upon has been $1.00 per square foot, which price includes the rental of space, floor covering, sign, dividing railings, furniture, decorations and the care of the exhibit in so far as sweeping, etc., are concerned. By making no extra charges for these various items, it will readily be seen that each exhibitor can tell at a glance the cost of showing his product.

The interest being manifested by manufacturers throughout the country is very noticeable, and applications are being received for space, many of the larger companies having already booked. The exhibit is to be run for the benefit of the exhibitors, and should there be any surplus after its close, it will be distributed among the members of the association of which any exhibitor will be eligible.

NATIONAL ASSOCIATION OF HOSIERY AND UNDERWEAR MANUFACTURERS.

The fourth annual convention and the third annual exhibition of the National Association of Hosiery and Underwear Manufacturers will be held in Philadelphia on May 10th-13th, 1909. It is intended to make this exhibition of far greater proportions and value than those that have been held heretofore.

The cost of space will be upon a basis of sixty-five cents per square foot, no limit to space. This will include railings, signs and decorations. The entire exhibition hall will be fitted with uniform railings, booths, signs and decorations, thus adding materially to the value and appearance of the exhibition. Some spaces will be more valuable than others, and rather than charge an advanced price, spaces will be leased in the order in which contracts are received; in other words, the one who sends in first contract will be permitted to select the most desirable space, and so on.

There are, as a general rule, three requirements in the dyeing of loose wool and slubbing, these being: Fastness to light, fastness to milling, and the preservation of the wool in an open condition.

Fulling stocks.—The original form of machine used for fulling or milling the cloth. The milling machine has very extensively taken its place.

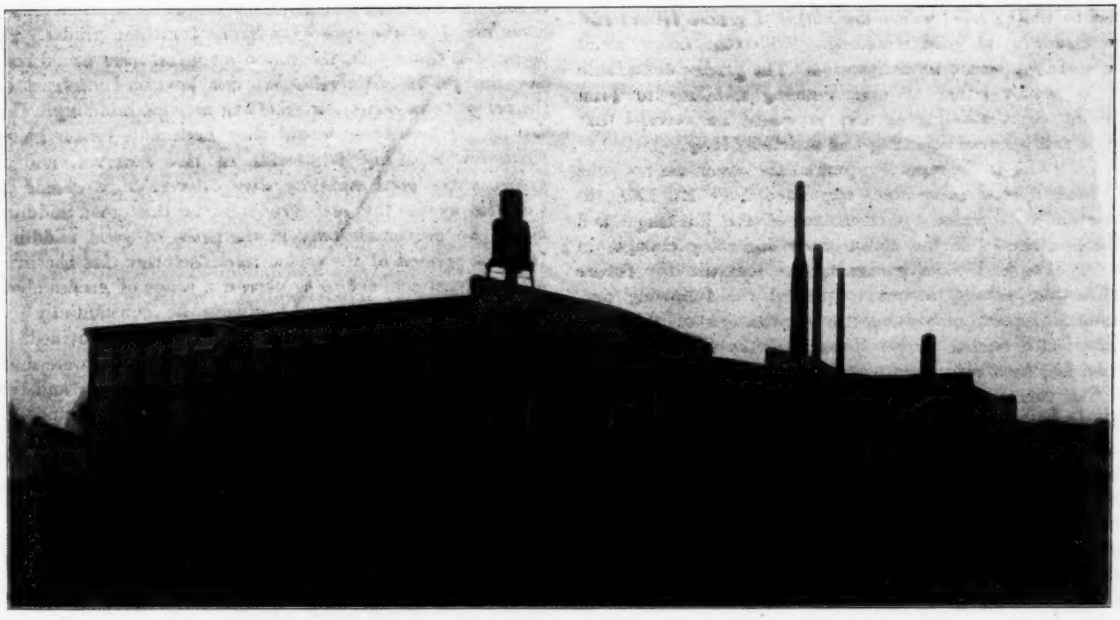
RICHMOND HOSIERY MILLS, ROSSVILLE, GA.

The Richmond Hosiery Mills, Rossville, Georgia, were first known as the Chattanooga Knitting Mills, Chattanooga, Tennessee, incorporated in 1896, with a capital of $4500 by Garnett Andrews, the present manager, and were successful from the start. Two years later, the capital stock was increased to $100,000, a new charter taken out in the State of Georgia, and the plant moved from Chattanooga to Rossville. Since then, the capital has been increased to $200,000, and many improvements have been made.

This corporation now has its own spinning mill and owns knitting mills at East Chattanooga, Tennessee, manufacturing the well-known "Wunderhose" line of hosiery. middle man, and manufacturing the complete product from the raw material under one management is nowhere better carried out than here.

Situated on the edge of the cotton fields, buying its cotton direct from the farmer, doing its own spinning, making its own boxes, doing its own dyeing, printing, and selling direct to the consumer, the company has been enabled to build up a business catering to eight thousand customers over the entire United States, to say nothing of quite a large percentage of export business that it does, thus placing it in a class by itself.

This is in great contrast to the methods pursued abroad, where the cotton is grown in America, the yarn spun in



RICHMOND HOSIERY MILLS, ROSSVILLE, GA.

It employs about 800 people, and has twenty-five salesmen on the road, covering every State in the Union. Its appropriation for advertising for 1909 for the "Wunderhose" line, amounts to $100,000. This company exports more hosiery to Cuba than any other single manufacturer. Its mills' equipment is of the very latest. It has three hundred Standard knitting machines, with all the latest improved machinery. It also has its own paper box factory, printing shop, and its spinning mill is a model of its kind, equipped with Howard & Bullough machinery throughout, driven with rope drives. The power is developed from a 250 horse-power Allis-Chalmers engine, and one Lane & Bodley corliss engine, transmission being furnished by the Dodge Manufacturing Company, Mishawaka, Indiana.

This company is one of the pioneers in the knitting industry in the South; and nothing better exemplifies the growth of the New South than does the growth of this corporation. Furthermore, the process of eliminating the one mill, the goods dyed in another mill, paper boxes manufactured in still a different factory, and the product sold to the jobber before it reaches the retailer.

The business of this company has grown in twelve years to be one of the chief factors in the United States in its line. None of the men connected with the business ever had any previous experience, which shows the opportunities that lie at our doors to be grasped by the industrious Southerner. This industry is one of the most important textile ones of Northern Georgia.

The manager, Garnett Andrews, is a native of Washington, Wilkes County, Georgia. His grandfather, at one time, having been candidate for Governor of Georgia, on the old "Know Nothing" ticket.

The present mill derives its name from the late Edward G. Richmond, its first president, son of Dean Richmond, first president of the New York Central and Lake Shore Roads.

This mill turns out three thousand dozen hose per day,

and about one hundred thousand pounds of hosiery yarn per month.

The directors of the company are as follows: J. S. Bell, president, Chattanooga, Tenn., capitalist of that city; Garnett Andrews, vice-president and treasurer; J. A. Boyle, secretary; Mrs. E. G. Richmond, Chattanooga, Tenn., and Garnett Green, Washington, Georgia.

A FUTURE CONTRACT FOR SPINNERS.

The special committee that was appointed by the New York Cotton Exchange last July to investigate the criticisms against the exchange's contract system, submitted its report to the board of managers, February 8th, in which it was recommended that an independent contract be created designed for the use of cotton spinners and manufacturers, though this contract is not intended to supersede in any way the old form of contract that is now being dealt in at the exchange.

The cotton deliverable on this contract would be confined to white cotton within the range of grades from strict low middling to good middling. No cotton below strict low middling would be deliverable. The grades deliverable would consist either of even running middling or even running strict-middling or may represent an average that would fall between middling and strict-middling.

Following is the report in part of the committee:

Your special committee, appointed July 20, 1908, to ascertain the opinions of members of the Exchange and others interested in the cotton trade regarding changes in the by-laws and rules governing the contract for future delivery of cotton, desires to present the following preliminary report, embodying the conclusions of the committee with regard to two phases of the broad question which has been referred to it.

The two phases of the general question which are covered in the present report are:

(1) The advisability of establishing, for the particular benefit of cotton manufacturers, a special contract for the future delivery of cotton, in addition to the general contract now in use; and

(2) The necessity of making deliveries of cotton on contracts for future delivery correspond, in so far as the method of determining the class of the cotton is concerned, to the general practice of the cotton trade in the delivery of cotton by cotton merchants to spinners.

Before your present committee was appointed a communication had been received by the Exchange from the American Cotton Manufacturers' Association in the form of a letter, under date of May 21, 1908, signed by a committee of that association stating that this large and influential body of cotton manufacturers had arrived at the conclusion that certain form of contract for the future delivery of cotton, which they had in mind, would better suit their needs than the form of contract at present existing on the New York Cotton Exchange. This committee expressed a desire for a conference with representatives of the New York Cotton Exchange for the purpose of laying its views fully before the Exchange. This conference was held July 15, 1908.

Stated generally, the following is the substance of the proposals of the American Cotton Manufacturers' Association:

The purchase and sale of contracts for the future delivery of cotton as a "hedge" against the undertakings of cotton manufacturers is being constantly more generally recognized as a necessary part of the conservative conduct of the cotton manufacturing business. Directly themselves, or indirectly through cotton merchants, spinners are employing this means of self-protection more largely every year. There is a growing desire among spinners, moreover, to do this "hedging" directly for their own account. They conceive, however, that the form of the contract for the future delivery of cotton now existing on the New York Cotton Exchange and on the other great exchanges, originally devised mainly for the use of cotton merchants, is in certain respects not suited to the use of generality of spinners.

The form of contract desired by the cotton manufacturers is one under whose terms only those grades of cotton shall be deliverable which the average spinner can, if he chooses, receive upon such contracts as he may have outstanding with the certainty that he can use them in his own mill, and that he will get the basis grade, middling, at the prevailing price for middling, and such other grades as may be delivered to him at the prevailing market differences ruling at the time of delivery for those grades. To accomplish these ends, the cotton manufacturers would confine the grades deliverable on this proposed contract to the range from strict low middling to good middling. Under no circumstances would they have any cotton below strict low middling deliverable on this contract, and if grades above good middling were deliverable, it should be with the proviso that such grades higher than good middling should be deliverable only at the price of good middling. It is the opinion of the cotton manufacturers that the price of a contract confined to so narrow a range of grades above and below middling would always be substantially the same as the prevailing price of middling (provided, of course, that the differences for even these grades were made to conform strictly to the prevailing differences), and that even if at times, such, for example, during heavy liquidation of contracts, the price of the contract should fall materially below the prevailing price of middling, the spinner could always protect himself by taking up the actual cotton, assured that he could use it at his mill.

Your committee is of the opinion that it will be decidedly to the advantage of the New York Cotton Exchange to meet as fully as possible the views of the spinners who desire the contract above outlined. The committee desires to recommend, therefore, that the board of managers take immediate steps toward the formulation of an additional contract, to be known by the name of the spinners' contract, or by some other suitable name, to be traded in by members of the Exchange, for themselves or their customers, if they so desire.

George W. Harris, inventor of the loom harness machine, died February 16 at his home in Lowell, Mass., aged 82. He leaves a widow and daughter. He was one of the wealthiest men in Lowell.

A bill has been introduced in the Texas legislature having for its object the adding to the Agricultural and Mechanical College of a department of inspection in the theory and practical art of grading, classifying and stapling cotton. An appropriation of $5,000 is asked for.

Previous to the use of the bichromates as mordants, alum was then largely used, as well as the salts of tin for dyeing wool.

COTTON IN RELATION TO ITS MANUFACTURE.

BY HENRY G. KITTREDGE.

Lecture before the Cotton School of the State College of Agriculture, Athens, Ga.

PART II.

PHYSICAL NATURE OF THE FIBER.

Those who have not studied the cotton fiber, intelligently and knowingly, with the aid of the microscope have little or no true idea of its physical nature upon which the real secret of spinning largely depends. The fiber is a single-cell filament, and, in its matured state, is more or less twisted about its central axis, which can be developed by cultivation. The fiber of the wild varieties of cotton has little or no twist. It is this twist that gives to the fiber its clinging quality, so greatly valued in the spinning processes; and because it is lacking in such vegetable fibers as those of the thistle, the latter can not be spun, no matter how long they may be. The cause of the twist is in the drying of the cell contents of the fiber, which collapses into the form of a ribbon with thick edges, like a figure eight. A fiber of any kind can not assume a twisted form unless it is more or less flat. The hair of the Caucasian race, for example, is cylindrical and therefore has no twist in it, but flatten it by drawing it between the nails of one's fingers, it at once becomes twisted or spiral. It is because of the roundness, or lack of twist, of the fiber of the wild varieties of cotton, that makes the latter deficient in spinning qualities. Moreover in the cultivated variety the immature or unripe fiber is defective in twist, and, consequently, to that extent defective in spinning quality. The microscopic examination of an immature fiber from a freshly opened boll may show, apparently, a twisted filament, but it will be seen upon closer study that the apparent twist is more of a fold; or it may be the fiber under examination is one that has been exposed to air and sunlight, and become somewhat ripened, when an essaying twist is observed. In order for the fiber to receive a twist, it must become desiccated by an exposure to the air and sunlight. The convolutions are not regular or consecutive in any fiber. They appear in one direction and then in another, and are of different length, and more frequently not complete with a full turn, but the fiber convolutes sufficiently to give it the clinging or attaching properties necessary for the process of spinning. The number of these twists or windings varies with the variety of the cotton and its cultivation, and the climatic influences to which it has been exposed, but the range is from one hundred to two hundred and fifty to the inch. As a rule the finer fibers, as the Sea Island, have more twists to the inch than the coarser ones, as the Surat of East India, or those of China. On the exterior of the fiber is a coating of substance of a waxy nature that it derives from the seed, and has certain preservative functions not unlike those of the yolk on the wool fiber. It also gives the fiber a suppleness that is so highly regarded in spinning, for which purpose, however, it must possess a degree of fluidity that it can not attain except in a warm, humid atmosphere. It is for this reason, that the spinning and weaving departments of a factory have to be kept at a comparatively high temperature and high relative humidity.

DENSITY OF COMPRESSED COTTON.

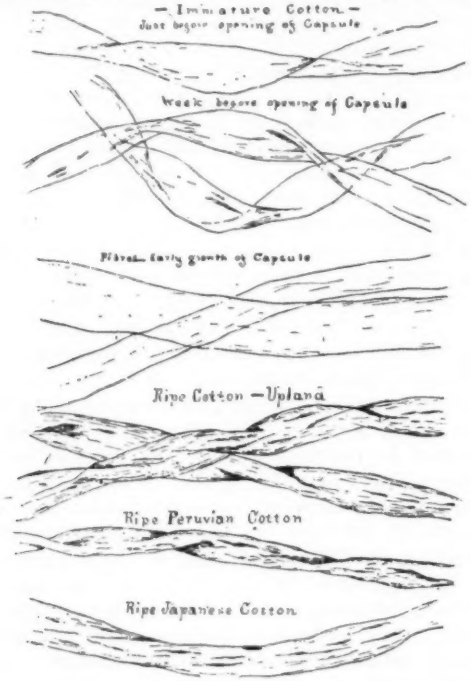
In passing it may be stated that the specific gravity of cotton is about 1.5. That is, it is fifty per cent. heavier than water, and for this reason a bale of cotton will sink if immersed in water, just as soon as the interstices become filled with the liquid. Applying this to the density of cotton as ordinarily baled at the ginnery or compress, at 12 and 23 pounds, respectively, per cubic foot, and we have a compactness of about one-eighth to one-fourth of absolute solidity. It may be stated that a cubic foot of water weighs 62.4 pounds, and cotton being fifty per cent. heavier will weigh 93.6 pounds per cubic foot if condensed to an absolutely solid body, as was the core of the so-called "round bale" when first made. Should cotton be compressed to a density of 93.6 pounds per cubic foot it would, as can readily be seen, be actually spoiled beyond recovery. But should it be compressed to a density of 40 to 50 pounds per cubic foot no injury would likely occur to the staple. While speaking of the compressed density of cotton, it must be understood that the staple has its natural moisture of about eight per cent. of its weight. This percentage refers to the regain of moisture when the cotton is exposed to the air, after it has been thoroughly dried. It may be noted that this percentage of regain varies somewhat with the state of the atmosphere in different localities.

Before leaving the subject of the physical structure of the fiber it may be observed that it is almost impossible to destroy it by any mechanical process and only so by a very drastic chemical process. For instance, in the carbonization of woolen rags, containing more or less cotton, in the manufacture of wool shoddy, for which concentrated sulphuric acid and a high degree of heat is required for the elimination of the cotton by reducing it to a pulverulent substance, the cotton powder or dust shows under the microscope the unmistakable configuration of the fiber. The same thing can be said of the wool fiber, that its destruction by any physical process is extremely difficult, and its mastication by the larva of the clothes, or wool, moth may be instanced. If the contents of the alimentary canal of this larva be microscopically examined after it has fed on wool, it will be seen that the minute pieces of the fibers are easily distinguishable for what they really are.

THE SAW GIN.

Much has been declaimed against the saw gin for damaging the cotton and injuring its physical structure for purposes of manufacture. This machine is not properly subject to the anathema that is cast upon it so freely and indiscriminately by both spinners and farmers. True, it is not a gentle machine for separating the fiber from the seed. If it were it would fail to do its duty. It is not so easy on the fiber as the roller gin, but for the upland variety of cotton it is a better machine from a commercial point of view. It is condemned, in most cases, because it

is misused and improperly cared for. When in good running condition and operated at a proper speed, it does its work well, drastically, it may be, but well, with little or no injury to the fiber that can be readily discovered by any microscopic examination or otherwise. No little discussion has been indulged in, and illustrations shown, concerning the damage done by the saws of the gin as the fibers are pulled from the seed through the ribs of the machine. Theoretically, if not actually, no doubt there is some impairment done to many of the fibers as they are jerked through the ribs and bent in the shape of a V, but



COTTON FIBERS.
Definitions of a 400 Magnification.
By H. G. Kittredge.

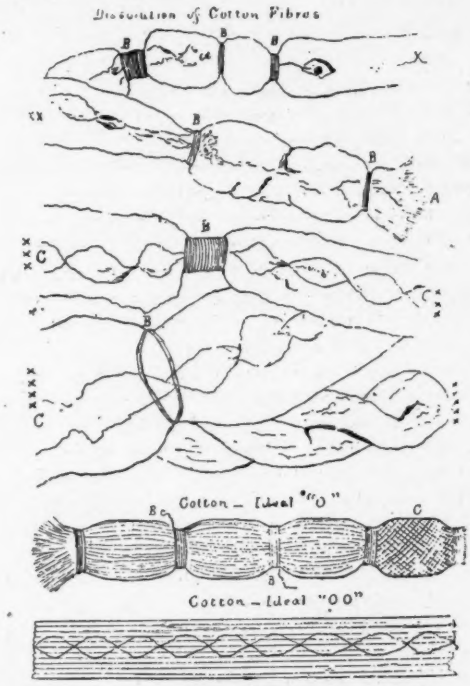
the impairment is very greatly exaggerated, in my opinion. But the product of a poorly adjusted and poorly operated machine should not be taken as a criterion of its effectiveness and utility. The standard of a machine's efficiency should be the product of what it is capable of turning out under proper conditions of operation. Moreover, it should not be judged of if it is required to do work upon improperly prepared material, as damp and uncured cotton. No machine can do good work unless it is in proper order, with its parts acting in proper relation to one another. The cause of bad ginning is, to a great extent, due to inattention on the part of incompetent attendants who neglect taking care of their machines and keeping them up to a good running standard. Furthermore, there is a disposition to crowd a machine beyond its capacity for satisfactory work. As a rule, a gin is forced to do fifty per cent. more work than it should, and when this is done a poor product should be expected as is really the case. The machine is not at fault so much as the way it is cared for and operated. It is not infrequently left to the mercy of ignorant help, and to those who are after the greatest production that can be gotten out of it, without regard to its quality. There is a society for the prevention of cruelty to animals, it would not be out of place if there were a society for the prevention of cruelty to cotton gins and their product. The cotton gin is not the only piece of mechanism for the treatment of cotton in the general process from the time it is separated from the seed to its appearance in the spun yarn, that is operated beyond its capacity for good work. Nearly every machine in an American cotton mill is overtaxed, in the grand rush for production. Take, for instance, the carding machine. The fiber is probably injured by this machine more than any other in the factory or by the gin, and yet none would be so irrational as to condemn it as unfit for the functions that are required of it. Any deterioration to the fiber by this machine is owing to a want of care in keeping it in good condition and its parts properly set, and by overtaxing its productive capacity.

CHEMISTRY OF THE FIBER.

I have left for myself very little time to speak of the chemistry of the fiber in its relation to bleaching and dyeing. Cotton is a carbo-hydrate, or a compound of carbon, hydrogen and oxygen, with, in its natural state, about three or four per cent. of extraneous substances as coloring matter, an amorphous body known as pectose, a kind of wax, and albuminous matter, all of which are removable by chemical agents. It is an almost pure cellulose, and as such is nearly indestructible, and incapable of decay except when acted upon by nitrogenous elements. This property of self preservation is one of the wonderful attributes of cotton that allows it, in the form of fabrics, to chronicle the state of art and industry in ages long gone by. Flax possesses much of the same quality of durability. It is the province of bleaching to eradicate the extraneous substances attached to the fiber, and this is accomplished by submitting it, in common practice, to caustic soda and chloride of lime. The latter removes all coloring matter. The only wax on and in the fiber has, of course, an economical value in its nature, and serves to impart elasticity to it as an essential quality for spinning, at the same time it must be more or less fluid, which can be effected only by a high temperature, a condition that must exist in the spinning department of a mill, accompanied by a certain degree of relative humidity. It is worthy of observation that this wax dries up and becomes harder, by loss of its volatile constituents, with the age of the cotton, and to this extent its removal becomes more difficult, and its fluidity less subservient to the influence of heat and moisture in the process of spinning. It is for this reason, and it is about the only reason, why some spinners prefer newly picked cotton to that which has been long picked and allowed to dry—it has more elasticity in it. In speaking of the fluidity of the wax, plasticity is more nearly meant, for it takes about 187 degrees of temperature to melt it.

As every one knows who is at all familiar with it, cotton varies in color, and in some instances to a very marked degree. This coloring matter is called endochrome and seems to be a constituent of the vegetable cell, not only of cotton, but of all plant life, as seen in the vernal and autumnal leaves of all vegetation. Its composition has not yet been ascertained, but it is soluble in alcohol, and destroyed in the presence of oxidizing agents as sunlight or such as are employed in bleaching. The reddish-brown endochrome of a variety of Egyptian cotton is highly es-

teemed for some manufactures, as hosiery, and many efforts have been made in this country to cultivate it in the ordinary upland or by the introduction of the Egyptian cottonseed itself, but no satisfactory results have been attained. The coloring matter pervades irregularly the entire fiber and is found not only in the central cavity, or lumen, but in the cellular walls. It is somewhat peculiar to the wild varieties of cotton, but generally disappears upon cultivation. Why it is retained in Egyptian cotton is one of the things that has not yet been determined. Some attribute it to the nutritive elements of the soil. If the brown Egyptian cotton could be successfully cultivated in this country it would be a great thing for both the grower and the spinner.



COTTON FIBERS.

Action of an Ammoniacal Solution of Oxide of Copper Showing Structural Features of the Fiber. Experiment by H. G. Kittredge.

O and O O are diagrammatic exhibitions of the structure of the fiber showing longitudinal striæ evolved at A. This evolution is seen while the fiber is undergoing its transformation. A spiral core is seen in O O, and in XXX at C.

B. B, are binding filaments or threads. When the solution is strong and the swelling of the fiber is rapid, these thread-like bands sometime burst and throw off tiny ends as seen at B in O.

X to XXXXX are representations of cotton fibers at moments of cessation under the influence of the solution.

XXXXX shows a fiber that has assumed a knotted twist, one of the many shapes that cotton fibers take in their convulsions when submitted to the action of the solution.

BLEACHING.

The bleaching of cotton is a very important branch in the manufacture of cotton fabrics. At least a million bales of cotton manufactured in the United States into cloth and yarns alone are bleached. Probably as much more again is bleached for subsequent operations in dyeing or printing, and for other purposes. Thoroughly bleached cotton is about as near pure cellulose as it is possible to get it commercially, but the bleaching should never be carried so far as to affect or touch the outer membrane of the fiber. The secret of perfect bleaching, or its efficacy, lies in carrying its operations to the point of eliminating all extraneous matters without their attacking the thin exterior membranous layer of the fiber. This outer layer is the protecting sheath of the fiber and has a composition peculiar to itself unaffected by chemical agents that readily attack the cellular structure of the inner portions. This is beautifully demonstrated under the microscope upon submitting the fiber to an ammoniacal solution of oxide of copper, that was first discovered in 1863. The demonstration is a very simple one, and what it exhibits in unfolding the structural formation of the fiber is fascinating. So far as the bleaching of cotton is concerned, it may be stated that all cotton will not bleach alike, and some kinds are poorly susceptible to the desired action of bleaching agents. An instance may be made of blue cotton which seems to be either incapable or difficult of bleaching satisfactorily as compared with that which is white or yellow.

MERCERIZATION.

One of the processes connected with the manufacture of cotton is that of mercerization, which is something that has come into vogue within the last decade by which cotton yarn and cloth are given a luster and finish similar to that of silk. Mercerized goods are to be found in all of the markets in this country, and for sale on all the retail counters under various names, as silkoline and other trade names, that appeal to the fancy of customers, so as to give a sort of impression that they are made from true silk. Sometimes yarn which has been lusterized by a mercerizing process is largely used for twisting with worsted or woolen yarn for ladies' dress goods and those for men's wear, the same as if it were silk, which it closely resembles in appearance, without deteriorating the quality of the fabric, but rather adds strength and durability to it.

There are no statistics or records by which one can judge of the amount of cotton in the manufactured form that is mercerized, more than that it is known, according to United States census figures, that in independent bleaching establishments, where the mercerized operations are usually conducted, about fifty thousand bales of cotton undergo the mercerizing operation after it is manufactured. Mercerization is never applied to the raw material, but only in its manufactured form for good and sufficient reasons of manipulation.

Mercerization consists, in its fundamental features, of submitting the yarn or goods to a cold solution of caustic soda at a specific gravity of about 1.4, which has the property of strengthening the material and improving its power for receiving color and making it not only brighter or more lustrous, but more permanent. The action of this alkaline agent upon cotton was discovered nearly sixty years ago by John Mercer, of Lancashire, England, who brought his discovery to the attention of the world at the London exposition of 1851. This discovery remained dormant, for any commercial use, till about ten years ago when certain mechanical contrivances were invented which gave it practical utility in manufacturing.

The effect of this process upon the cotton fiber is to make it rounder and smoother with the convolutions or twist entirely removed, the effect of which, as may be readily

reasoned, is to give it a brightness and luster that it does not possess in its natural state. The luster is reflected from the fiber or the yarn of which it is the constituent part, the same as that relating to a round and highly polished bar of steel, as compared with that which is twisted. The application of this discovery of Mr. Mercer's is one of the greatest improvements in the manufacture of cotton that has occurred in recent years. One of its most valuable features is that it strengthens the yarn or cloth to the extent of at least twenty-five to thirty per cent., so that any one purchasing a piece of cloth that has been mercerized secures a relatively strong as well as handsome piece of goods.

Time will not permit me to go into the subject of dyeing that possesses so many interesting features in connection with the physical and chemical nature of cotton. The theory of dyeing is not yet solved, and in some respects is no nearer a solution than it was a century ago.

There is a great deal in common between the cotton grower and the cotton spinner, and success to each largely depends upon their co-operation, in producing what is most desirable for purposes of manufacture on the one hand, and in remunerating the intelligent efforts in this direction on the other hand.

COTTON GROWING IN AFRICA.

(*Special to Cotton.*)

The sixtieth meeting of the council of the British Cotton Growing Association was held at the offices in Manchaster, England, last month.

Reports were made concerning the growing of cotton in different districts of Africa as follows:

BRITISH EAST AFRICA. As the quantity of cotton produced in this district is rapidly increasing, it has been decided to send out a hydraulic press to be erected on the coast, and this will effect a considerable saving in the cost of freight on the cotton.

UGANDA. The value of the cotton exports from this protectorate for the twelve months ending, March 31, 1908, was $260,000, and it is estimated that the exports during 1908 amounted to between 5000 and 10,000 bales of 400 pounds each. The cotton generally is a very desirable quality, and commands a ready market, and has recently been sold at prices varying from 1½ to 2½ cents on "middling."

NYASALAND. It was reported that for the seven months ending October 31st last, cotton headed the list of exports, the value being placed at $97,285, coffee ranking next at $91,940.

WEST AFRICA. The reports on the association's experimental plots at Ibadan have been received, and are very satisfactory, showing that the first pickings from the American varieties have yielded on an average from 150 to 200 pounds of lint cotton per acre. It was reported that the new crop is now beginning to come in, and the purchases in Lagos for January amounted to 540 bales, as against 82 bales for January last year, and 592 bales for January, 1907.

The president mentioned that the government had recently made arrangements for the transport of 26,000 tons of material during 1909, for the construction of the Northern Nigerian Railway, and he thought that the native cultivators would shortly have splendid transport facilities for their cotton. He considered that the development of the cotton growing industry in Nigeria alone fully justified the existence of the association, and was sanguine that within the next five years a tremendous quantity of cotton would be produced and shipped to Lancashire.

An allotment was made of 122 shares which had been applied for during the month, bringing the total amount of capital subscribed to date to £261,315.

NEW YORK COTTON EXCHANGE.

CHANGES IN BY-LAWS AND RULES.

Several important changes in the rules of the New York Cotton Exchange passed into effect the first of the current year, reading as follows:

"False or fraudulently packed cotton is defined as follows: Such bales as may contain any foreign substance, water-packed bales, or bales containing damaged cotton in the interior with or without any indication of such damage upon the exterior of bale; also such bales as are plated or composed of good cotton upon the exterior and decidedly inferior cotton in the interior of the bales in such manner as may not be detected.

"A mixed packed bale is defined as a bale showing two grades of cotton, one grade each side, but no bale shall be considered mixed packed that does not show at least one full grade difference between the two sides.

"Any claim made in accordance with the above within ninety days from date of delivery, and verified by oath or affirmation, shall be deemed, prima facie, valid in favor of the claimant, and it can only be defeated by the decision of an arbitration or the board of appeals.

"Provided that in all cases of claims for fraudulent packing, the party on whom the claim is made shall have the right to demand the return of such bale or bales. If, upon examination of such bale or bales when returned, it is ascertained that such claim is well founded, the party against whom such claim is made shall pay the cost of such transportation, both from and to New York. The seller shall receive back such bale or bales and settle therefor at the price of sound cotton of a like quality on the date of discovery of such fraudulent packing. In the event that it is decided that such claim is not well founded, all expenses shall be borne by the party making the claim."

In addition to the foregoing, changes were made in the by-laws of the exchange as follows:

"In determining the grades of cotton submitted to the classification committee, or to the appeal committee on classification, sand, dirt and gin cut shall be taken into account and consideration.

"Gin cut cotton, where the extent of gin cutting is such as to reduce the value of the cotton more than a full grade, shall not be deliverable on contract."

The small amount of oil in slubbing in the better-class wools does not interfere to a great extent with the dyeing, unless very bright shades are required.

Nature's laws are very obstinate at times—so is crossbred wool—and hybrid offspring sometimes refuse reproduction.

LONDON COLONIAL WOOL SALES.

ACTIVE DEALINGS IN MERINO WOOLS. LARGE OFFERINGS SUITABLE FOR THE AMERICAN MARKET, OR IN LIGHT CONDITION. WHY ALL WOOLS ARE NOT SUITABLE FOR AMERICAN CONSUMPTION.

The reports of the London colonial wool sales for last month show active dealings in greasy and scoured merinos. It appears that the auctions were well attended with competition very spirited and prices fully equal to the best point of the series. The best of the greasy merino wool clips included among them some Queensland offerings that realized 26 cents per pound. A good quantity of fine greasy "come-back" wools from Victoria were actively competed for and secured by English and American buyers, the bulk of the clip ranging from 27 cents to 29 cents per pound. As a matter of explanation it may be stated that "come-back" wools are, in a sense, different from "cross-bred" wools in that the latter are derived from the breeding of the merino sheep upon English blooded sheep while the former is a kind of reversion, in that the "cross-breds" are bred upon the merino or more to the latter type. The West Australian medium greasy merinos met a brisk demand, practically all being obtained for Yorkshire and other English centers within the range of 17 cents to 23 cents per pound. The Sydney offerings included a fair quantity of fine merinos, the best of which were obtained presumably for America at 27 cents per pound. The Victorian scoured were actively competed for by Continental and English buyers, the latter securing most of the fine-haired clips up to 46 cents per pound. The "cross-breds" continued in request especially for Yorkshire and the United States, the latter obtaining the best of the light-conditioned greasy parcels at 27 cents per pound.

In this series of sales of colonial wool in London, there appeared a larger quantity than usual of wools which were referred to in the daily reports as being "suitable for the American market," all of which were, without exception, described as being "light-conditioned." It thus appears that the American buyers could afford to pay higher prices for such wool than either the English or Continental buyers which necessitated, of course, the out-bidding of the latter in order to secure the wool, for it must be understood that this wool is as suitable, at a certain price, for European consumption as for American.

Apropos to the above status of the colonial wool sales may be given the following communication that we have received from an English correspondent, and which may be read with special interest in connection with the present agitation concerning the revision and application of the United States customs tariff laws on imports of foreign wools to be used in American manufactures.

Colonial Wool.

An expression which often occurs in the daily reports of the London colonial wool sales is "to-days catalogue contained a good selection of wools suitable for America." From that it may be inferred that there are other wools which are not suitable for the American market, and judging from the operations of American buyers, that appears to be the case.

Why is this? Why are not all wools suitable for the American market, the same as for any other market? Is it that the American manufacturers are in the possession of secrets, or enjoy special facilities for the manufacture of wool, which are not shared by the manufacturers of other countries?

The expression "wools suitable for the American market" is generally understood to refer to the light-conditioned greasy wools of whatever quality they may be; and it has often been asked, why the European buyers allow (?) the American wool buyers to take the bulk of the wool of that character? Again, it has been asked, why do not the American buyers buy also the heavy-conditioned wools? It is also asked, how is it that American manufacturers can afford to pay a higher price for such wool than the wool buyers of other countries; for that they must do, in order to secure it, goes without saying. These are questions which deserve a little consideration.

It may be asked, do the European buyers allow the American buyers to take only wools of that character; or do they—knowing the conditions of wool manufacture in America—force, as it were, the American buyers to take it, or at all events, settle a price, below which they may not have it?

For those wools—the heavy-conditioned—which are not suitable for America, there is little or no competition from American buyers, and consequently the other buyers, being so far relieved of American competition "have it all their own way."

But the wools which are suitable for the American market are also equally suitable—at a suitable price—for the English and Continental buyers; and, until that price is reached, they are keen competitors of the American buyers. When, however, that price is reached, the European buyers "drop out," and leave the further biddings to the Americans, who then compete with each other, and ultimately one or another secures the wool at prices which it will not pay the European buyer to give for it.

Now American buyers are credited with knowing quite well what they are about, and are understood to have a good reason for their preference for light-conditioned wool. There is the import duty of 11 cents per pound payable on foreign wool imported into America, to be considered, and they can not very well afford to pay a duty of 11 cents per pound on grease; consequently it is manifestly to their advantage to purchase wool which will yield, after being scoured, the highest percentage of clean wool; and under the circumstances that appears to be a reasonable and proper thing to do. English buyers have no import duties to consider, and consequently it matters little to them, whether the wool be in heavy or light-condition, if only the price be right.

It is true the American manufacturer is protected by the imposition of corresponding high tariffs on imported manufactured goods, in order to enable him to manufacture successfully and to make a profit in his own markets on the goods, which, in competition with imported goods, he manufactures under such favorable fiscal conditions; and since those conditions are deemed to be necessary for the encouragement of her manufacturers, and to the prosperity of the country, it would be out of place to question their wisdom.

Still it would appear that the American manufacturer is placed at some disadvantage with European competitors, in the matter of the price of wool (apart from questions of duties) by reason of purchasing only the lighter-condi-

tioned wools under the conditions already mentioned, as will be made more or less clear, although imperfectly, by the following illustrations.

The percentage of clean wool, obtainable from greasy wools by suitable and adequate washing, varies considerably. It may be as low as 30 per cent or even less, and it may be as high as fifty per cent. or more; and only the most experienced judges can with any approach to accuracy, declare what percentage of clean wool could be obtained from any given sample of greasy.

In the following estimates, small fractions are omitted. The breed, quality, and other conditions of the wool at any given price in the tables may vary considerably, and the yield will possibly also vary in accordance with those conditions, and in order to cover those variations, two or more percentages of yield are given in each case.

Price in Grease. Cents	Percentage of yield, and cost in cents, per clean or scoured wool.					
	30%	35%	40%	45%	50%	55%
14	.46	.40	..	..	..	..
16	..	.45	..	..	..	..
18	..	..	.45	.40	..	..
20	..	..	..	.45	.40	..
22	..	..	..	.49	.44	..
24	..	..	..	.53	.48	..
26	..	..	..	.57	.52	..
28	..	..	..	.62	.56	.50

The above table indicates approximately the effect of European and American competition for wools suitable for the American market; as well also the effect of the absence of American competition in the case of the heavy-conditioned wools.

The wools quoted at 14 to 20 cents, inclusive, are chiefly for European consumption. Those quoted at 22 to 28 cents, inclusive, are known as light-conditioned, "suitable for the American market."

Price in Grease. Cents	Percentage of yield, and cost in cents, per clean or scoured wool, with the 11 cents per pound duty added to the grease price.					
	30%	35%	40%	45%	50%	55%
14	.84	.72	..	..	..	..
16	..	.77	.67½	..	..	..
18	..	..	.72	.64	..	..
20	..	..	..	.69	.61	..
22	..	..	..	.73	.66	..
24	..	..	..	.78	.70	..
26	..	..	..	.82	.74	.67
28	..	..	..	.86½	.78	.71

No account is taken of the cost of carriage or exchange.

ARKWRIGHT'S SPINNING FRAME.

This machine, invented and made by Richard Arkwright in 1769, was his first application of drawing rollers to cotton spinning.

The roving of sliver on the bobbins placed at the back of the frame, was led successively through four pairs of rollers, each pair revolving more quickly than the preceding pair, so as to draw out the cotton to a finer thread. From the drawing rollers the yarn passed through a wire guide placed over the center of a revolving spindle upon which were placed a bobbin and flyer, both of wood. On the lag of the flyer, hooks or "hecks" were fastened, and the yarn was passed round one of these, and afterwards round another, as different parts of the bobbin filled, as the idea of imparting to the bobbin a vertical motion upon its spindle so as to traverse the roving automatically had not been considered. The flyer was fixed to the spindle and turned with it, but the bobbin was loose. The rotation of the flyer carrying the yarn with it gave one turn of twist for each revolution. The bobbin under the pull of the yarn rotated in the same direction as the flyer. A band placed round the wheel of the bobbin, either tight or easy as required, put a drag on the bobbin, and caused it to wind the yarn.

The motive power was intended to be that of a horse, and it was applied by a vertical shaft standing on a wooden bracket projecting from one side of the machine and driven by spur gearing from the vertical shaft of the horse wheel. A pulley of large diameter keyed on the lower end of the countershaft turned the four flyer spindles by an endless belt, and by a friction wheel drove an upright shaft which gave motion through a pin wheel to the drawing rollers.

This machine could be used only for spinning the hard and strong yarns used for warp. The softer yarns for weft had still to be made by hand except in one or two places where James Hargreaves' spinning jenny was in use.

WORK SHOULD BE WELL DONE IN EVERY DEPARTMENT.

An experienced cotton cloth dyer can insure good work, if the bleaching is thoroughly done. Usually the only complaint a finisher has is that the goods are sent on without being thoroughly washed. A piece with all the color scrum still on the top looks very bad and is likely to retain its bad looks. The dirty top may be washed off in the process of finishing, too often it is not, and the goods, in consequence, never present a smart finished appearance. All dark shades should be thoroughly washed and cleared from the dirty scum collected in the dyeing process before the goods go to the finisher. His business is to finish, but not in the sense of finishing the dyer's own duties. If goods of this description require a Schreiner finish, hours may have to be spent in cleaning the bits out of the engraving which the bowl picks up as the goods go through the calender, and the speckled appearance together with the cloudy dirty dye makes a glossy finish impossible. The goods of course have to be turned back to be made right.

It sometimes happens also that the goods are pulled out of shape in the dyehouse. The carelessness of a workman in turning one jig band higher than the other when putting the cloth in the work will do this, or a roller in the bottom of the jig may be worn and out of order. This will pull the weft out of shape. All these things of course can soon be stopped if attention is given to the cloth when in work.

If to all these details a manager gives his personal attention, insisting that the work shall not leave a department until it is thoroughly well done, the goods will arrive at the finishing department in a good condition, and with the weft running straight from the selvage as it was when brought in the gray to the works. The finisher will then be able to turn out his work well and quickly.

Crefeld is noted for its velvet manufacture and velvet dyeing; Elberfeld for its dyeing; Munchen-Gladbach for its colored goods, etc.

COTTON MANUFACTURING

PROCESSES IN COTTON MANUFACTURING.

THE ROVING PROCESS. WEIGHTING OF DRAFT ROLLS. OBJECT OF THE FLYER. THE DIFFERENTIAL MOTION. CALCULATING THE TWIST. DRAFT.

BY CHARLES E. BARNHARDT.

PART V.

When the stock is delivered from the last process of drawing it should be virtually free from all impurities and short fibers, with the fibers straightened out and lying side by side.

The next process to which the stock is subjected is that of the slubber and fly frames. The three machines used in this process are the slubber, intermediate and roving frame. The construction and operation of these machines are similar to each other except that the slubber is heavier built than the intermediate or roving frame, while the roving frame is not as heavily built as the intermediate. The reason for this is that the stock is drawn out and consequently made lighter in its passage through each of these machines. The three objects of the fly frames are the drawing out of the sliver or roving, applying the necessary amount of twist to hold the stock together, and winding the stock delivered from the machine on bobbins.

The slubber differs from the intermediate and roving frame in the manner in which the stock is fed to it. The cans of roving from the drawing frame being placed at the back of the machine and fed into it, each end separate, while the stock fed to the intermediate and roving frames is on bobbins, which are supported by a frame known as the creel, attached to the back of the frame, two ends being run together instead of one, as is the case with the slubber. Each of these machines is supplied with three sets of drawing rolls, the bottom rolls being made of fluted steel and extending the entire length of the frame, while the top rolls are leather covered, made in short lengths and weighted somewhat similar to those of the drawing frame (See January, page 110). The middle and back rolls being weighted by one weight, this being attached to a saddle which rests on the necks of the two rolls, while the front roll receives its weight from a hook resting on its neck to which the weight is fastened. The weight on the front roll of the slubber should be about sixteen pounds, while the middle and back should have about twelve pounds. The weights required on the intermediate rolls are about four pounds respectively, less than for the slubber, on account of the stock being lighter here, while those for the roving frame should be about the same as for the slubber, since two ends are delivered from each boss at this machine, instead of one as is the case with the slubber and intermediate. The stock is drawn out in the same manner as it is on the drawing frame, on account of the variation of the speed of the rolls. From the rolls the stock is passed to the flyer which rests on the top of the spindle. The bobbin on which the stock is wound is placed on this spindle.

The object of the flyer is to guide the roving so that it will be wound on the bobbin in a regular manner, so that it may be readily unwound and not tangled. The twist is put into the stock by means of the combined revolutions of the flyer and bobbin. The winding of the roving on the bobbin is the most complicated object that this machine performs, and is one which in many instances is not thoroughly understood by all persons who operate these machines. The gear which drives the bobbin is loose on the bolster, through which the spindle extends, and the bobbin rail is raised and lowered so that the roving may be wound on the entire length of the bobbin.

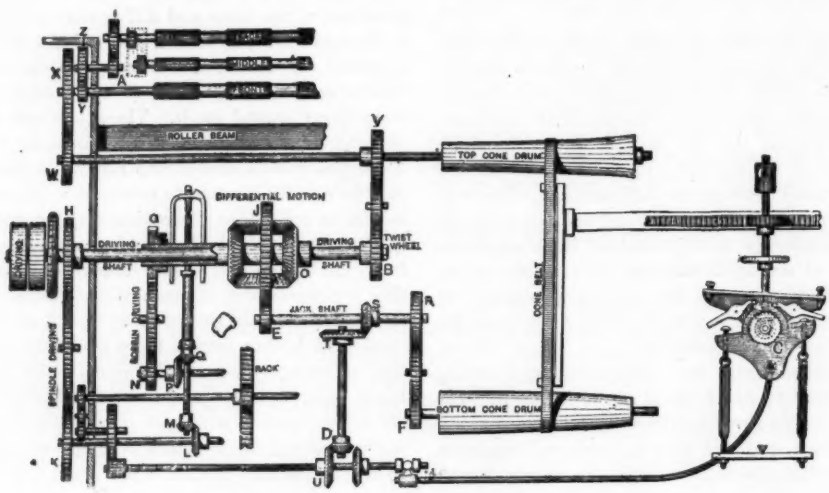
It will readily be understood that if the bobbin and flyer ran at the same speed the roving would not be wound on the bobbin. To overcome this, the speed of the spindle is the same at all times, while that of the bobbin is varied by means of the cones and differential motion, the difference in the speed of the bobbin and spindle being just enough to permit the roving to be wound on the bobbin. Thus it will be seen that the speed of the bobbin must vary with every layer wound on it. There are two ways of accomplishing this result, one being known as the flyer lead in which the spindle and bobbin revolve in the same direction, but the spindle is made to rotate at a faster speed than the bobbin in order that the roving may be wound. The other system, known as the bobbin lead, is in more general use. In it, the bobbin and spindle also revolve in the same direction, but the bobbin is made to run faster than the spindle, thus permitting the roving to be wound on the former.

As the bobbin lead is more generally used, an explanation of its operation will be given. The speed of the bobbin is controlled by the cones and differential motion, which act in conjunction with each other. There is a very erroneous impression in the minds of many mill men in reference to the differential motion, since some persons think that it changes the speed of the bobbin, (See September, page 370-372). This can be easily comprehended by considering the fact that it is impossible to obtain a different speed without changing the number of teeth in some gear which controls it. There are several different forms of differential motions, but in each of them there are two distinct drives, one of these being from the main shaft which drives direct to the bobbin and is the same at all times, the other is from the cones, its speed depending on the position of the belt on the cones. Thus it will be understood that the object of the differential motion is to avoid driving the bobbins from the cones, but to secure a more positive drive by means of the connection with the main shaft.

If the cones were depended on entirely to drive the bobbins there would be much trouble on account of the slippage of the cone belt when the machine is started up, or even while running at full speed, which would result in breaking the ends. At the end of each traverse the position of the cone belt is slightly changed, thus affecting the speed of the bobbin through the differential motion, this being the reason why some persons are led to believe that the differential motion affects the speed of the bobbin.

In order that the roving wound on the bobbin shall not be tangled, each layer put on is made a little shorter than the preceding one, thus both ends of the bobbin are tapered, this effect being produced by the lift of the bobbin rail being shortened at the end of each traverse, by means of the builder motion. The amount of taper that should be given is a very important matter, since the bobbins are often

roughly handled and if not firmly built many of them will be tangled and would be fit for nothing but waste. The amount of taper given for each successive layer should be one row less than the preceding layer, thus if the first layer has one hundred and twenty rows, the second should have one hundred and nineteen, and the next one hundred and eighteen, etc. The length of the traverse can be changed by taking off the gear of the builder which connects with the rack gear, and opening or closing the jaws of the builder until the required traverse is obtained. The lay gear controls the speed of the upward and downward motion of the bobbin rail, since it is necessary that it be moved faster when coarse roving is being made than with fine. The tension gear regulates the distance which the cone belt is moved on the cones at each change in the direction of motion of the bobbin rail, thus changing the speed of the bobbins. If



A Gearing Plan of a Roving Frame.

A. Draft wheel. B. Twist wheel. C. Star or rachet wheel. D. Lifter wheel. E. Jack wheel. F. Bottom cone end wheel. G. Driving wheel for bobbins. H. Driving wheel for spindles. I. Back roller wheel. J. Sun wheel. K. Outside spindle wheel. L. Skew gear wheel for spindles. M. Spindle bevel wheel. N. Outside bobbin wheel. O. Driving bevel for differential motion. P. Skew gear wheel for bobbins. Q. Bobbin bevel wheel. R. Jack shaft wheel. S. Lifter bevel wheel on Jack shaft. T. Upright bevel on lifter shaft. U. Strike or lifter bevel wheels. V. Top cone drum wheel. W. Top cone drum end wheel. X. Large front roller wheel. Y. Small front roller wheel. Z. Top carrier wheel.

the ends run too tight or too slack they are regulated by changing this gear. A stop motion is attached to the rack which controls the cone belt, which comes in contact with the shipper handle and stops the machine when the bobbins are full.

Briefly stated the objects of the five change gears on roving frames are as follows, the draft gear which controls the draft of the machine, the twist gear which regulates the twist by means of changing the speed of the rolls, the tension gear which governs the movement of the cone belt, the taper gear which controls the builder motion, and the lay gear which changes the speed of the traverse motion of the bobbin rail or carriage.

In making slight changes in the weight of the stock to be made, it is only necessary to change the draft and twist gears; however, if the change to be made is one-half a hank, more or less, than that being produced, all the above mentioned gears should be changed. To find the draft on roving frames, use the same rule as has been previously given in connection with the drawing frame, since this rule is applicable to any machine where the stock is drawn out by means of rollers. In calculating the twist it is necessary to take into consideration all the gears between the front roll and the spindle. Considering that the front roll is driven, multiply the number of teeth in all the driven gears together, and divide the product thus obtained by that of all the driving gears, and divide this product by the circumference of the front roll, the result being the number of turns of twist per inch there is in the roving. The standard twist for roving is 1.20 times the square root of the number of roving produced, this result will give the number of turns per inch that the roving should have.

In order to find the proper gear to give a desired twist it is necessary that the twist constant be obtained, this is found by using the rule just given for finding the twist, except that the twist change gear is not considered in the calculation. When the twist constant is known, the number of teeth necessary in the twist change gear to produce a certain amount of twist is found by dividing the number of turns per inch required into the twist constant.

The calculation in reference to the lay, taper and tension gears are rather difficult to get at, since they will vary to a certain extent and are best determined by a little experimenting until the required result is obtained. The best rule is to multiply the square root of the hank roving, made by the gear being run to produce it, and divide this product by the square root of the hank roving desired to be made. This rule is also applicable in reference to finding the twist gear.

Fly frames are provided with a hank clock operated from one of the rolls, by means of which the production of the frame can be readily ascertained. To find the production, multiply the number of hanks indicated on the clock by the number of spindles on the frame, and divide this result by the hank roving being produced, this will give the number of pounds that the machine has turned off. It must be noted that any change of the twist gear will alter the production of the machine, as the speed of the front roll is governed by the twist gear.

Roving should have just enough twist to hold it to-

gether and prevent it from being strained when unwound from the bobbin, any more than this will prevent the fibers from being properly drawn out at the next frame. In piecing up a broken end a great many operatives have a habit of rolling the end from the bobbin between their hands, thus giving it an unnecessary amount of twist. This should be avoided since at the next machine this hard twisted place can not be drawn out by the rolls and will cause the end to be broken down on this machine. Care should also be taken that the ends of the roving do not overlap each other in piecing, as this will cause the roving to be too heavy at this place.

The distance apart that the rolls should be set, as at the drawing frame, depends entirely upon the length of the staple of the cotton being used and the weight of the roving produced. Ordinarily the front and middle rolls are set from one-sixteenth to one-eighth of an inch further apart, from bite to bite, than the length of the cotton run, while the back roll should be set about one-half an inch more than this from the middle roll, on account of there being very little draft between the middle and back rolls. The front and middle rolls should be set as close together as possible without there being any danger of the fibers being broken by being caught by the front roll before they are released by the middle roll. When the bottom rolls are changed, the top rolls should also be adjusted by moving the cap bars so that they are directly over the bottom roll.

All the fast running gearing of the frame should be well oiled twice a day. The bottom front roll should be oiled once a day, while twice or three times a week is often enough for the middle and back, and the top rolls to be oiled. The steps of the spindles should be filled with oil about once a month, as they are usually made large enough to hold oil to last for this length of time. The machine should be kept clean, the creel being brushed off every day; the bearings of the top rolls picked free of the short fibers which wrap around them, which if allowed to accumulate will cause the rolls to slip, and the flyers should be picked at every doff. At intervals of every few weeks the covers should be taken off the bobbin and spindle gears and all the waste which has accumulated around the shaft and gears removed, and the shafts oiled by applying a lubricating grease to each bearing which will furnish the necessary lubrication until they are cleaned again.

On the intermediate and fine frames, as two ends are fed into the machine together, it sometimes happens that one of the ends becomes broken, and the weight of the stock delivered is only one-half what it should be. All of these singlings, as they are called, should be taken off, since, if allowed to run on, they will result in an uneven place in the yarn. Much trouble is often experienced in the unnecessary breaking of the ends between the front roll and the flyer, caused by the cone belt slipping or breaking, too much tension, causing them to run too tight, or by some of the gears slipping. If there is not enough tension, the ends will run too slack and also be broken. Sometimes the traverse of the carriage is not properly reversed, causing the bobbins to run over and become tangled, caused by some of the gears slipping, or the spring at the bottom of the tumbler shaft not being strong enough to pull it around promptly.

Stock from the different frames should be weighed twice a day, and if running too light or too heavy should be corrected by changing the draft gear. However, the draft gear is not changed for every slight variation since the humidity of the atmosphere and the condition of the weather will affect the weight. In selecting the stock to be weighed, care should be taken that none of it has any singlings or doublings, as this will mislead any one from the correct weight.

The draft on the slubber should be about three and one-half, while that of the intermediate should be from four and one-half to five, and that of the fine frame from five and one-half to six. The amount of draft depending on the weight of the stock being run, since the draft is usually greater for light than for heavy stock.

ENGLISH SYSTEM OF TWIST.

A TABLE OF TURNS PER INCH.

To spin Weft and Twist from 10's to 132's

Weft Yarns $\sqrt{\text{counts}} \times 3.25$		Weft Yarns $\sqrt{\text{counts}} \times 3.25$		Twist Yarns $\sqrt{\text{counts}} \times 3.75$		Twist Yarns $\sqrt{\text{counts}} \times 3.75$	
Counts	Turns	Counts	Turns	Counts	Turns	Counts	Turns
10	10·27	72	27·57	10	11·85	72	31·81
12	11·25	74	27·96	12	12·95	74	32·25
14	12·16	76	28·33	14	14·03	76	32·68
16	13·00	78	28·70	16	15·00	78	33·11
18	13·76	80	29·07	18	15·91	80	33·54
20	14·53	82	29·43	20	16·77	82	33·95
22	15·24	84	29·79	22	17·59	84	34·36
24	15·92	86	30·14	24	18·37	86	34·77
26	16·57	88	30·49	26	19·12	88	35·17
28	17·20	90	30·83	28	19·84	90	35·57
30	17·80	92	31·17	30	20·54	92	35·95
32	18·38	94	31·51	32	21·21	94	36·35
34	18·95	96	31·84	34	21·87	96	36·74
36	19·50	98	32·17	36	22·50	98	37·12
38	20·03	100	32·50	38	23·12	100	37·49
40	20·55	102	32·82	40	23·72	102	37·87
42	21·06	104	33·14	42	24·30	104	38·24
44	21·56	106	33·46	44	24·87	106	38·60
46	22·04	108	33·77	46	25·43	108	38·97
48	22·52	110	34·08	48	25·98	110	39·33
50	22·98	112	34·39	50	26·52	112	39·68
52	23·44	114	34·70	52	27·04	114	40·03
54	23·88	116	35·00	54	27·56	116	40·38
56	24·32	118	35·30	56	28·06	118	40·73
58	24·75	120	35·60	58	28·56	120	41·07
60	25·17	122	35·89	60	29·05	122	41·42
62	25·59	124	36·19	62	29·52	124	41·75
64	26·00	126	36·48	64	30·00	126	42·08
66	26·40	128	36·77	66	30·46	128	42·42
68	26·80	130	37·05	68	30·92	130	42·75
70	27·19	132	37·34	70	31·37	132	43·08

The above table is for American and Indian cottons. For Egyptian and Sea Islands the multipliers for twist and weft are 3.606 and 3.183 respectively.

TO FIND APPROXIMATE PRODUCTION OF A MULE IN HANKS OR POUNDS PER WEEK.

$$\frac{\text{No. of draws per minute} \times \text{length of stretch in inches} \times \text{No. of working hours per week} \times 60 \text{ minutes}}{840 \text{ yards} \times 36 \text{ inches}} = \text{Hanks per week}$$

$$\frac{\text{Hanks per week}}{\text{counts}} = \text{lbs. per week}$$

NOTE.—To obtain working hours allow about 5 per cent. to 7½ per cent. for time required for cleaning, doffing, breakages, etc., depending on counts of yarn, time taken in doffing, etc.

NARROW FABRICS.

BY C. S. B.

Under the general heading of Narrow Fabrics are manufactured tapes, bindings and braids, thousands of kinds used for thousands of purposes. The great center of manufacture in this line is Philadelphia, where at least 1,200 tape looms are producing goods that reach every corner of the world. There are also extensive manufactories in New England. There are a number of stock tapes,

qualities and widths being made every day the year through, and from these there are infinite variations of colored and fancy tapes, any pattern or combination of colors made to order if bought in sufficient quantities to warrant making the warps and setting up the loom.

There is probably no manufactured article in the list of textile products that is so little observed, enormous qauntities being used for purposes where it is entirely hidden, such as in the manufacture of clothing and in electrical construction. Yet when one considers that probably 3,000 looms in the country are making tape and webbing there is no further statement necessary to convince one that it is an item of textile manufacture.

Every little notion store in the country sells tape in three or four yard rolls. The wholesale notion dealer will buy fifty or one hundred thousand dozen of these rolls on an order. It would require a tape factory of considerable size to supply this trade alone.

Since the advancement in electrical construction during the past few years, the tape production has necessarily been increased to meet this enormous demand. There is one electrical construction company alone that buys $200,000 worth of tape each year. This is used for wrapping armatures, etc., and is absolutely hidden from sight. When we consider how many manufacturers are making motors, large and small, it is easy to conceive what a quantity of tape is used in this line. The older tape manufacturers stepped into this electric tape business in the natural course, and new manufacturers sprang up to meet the general demand for regular goods. The business is still progressive. Hardly a tape factory in the country has not enlarged and added new looms in the last few years until this present year of general depression.

Not one man in a thousand appreciates the various uses of tape, but nearly every mill man in the country has use for some kind of narrow fabric either putting it in some part of his goods, such as underwear, or using it for tying purposes on piece goods, hosiery, etc. The tape item is a very considerable one in some mills—in fact, one of the largest items of expense among the supplies. For the underwear manufacturers it is, of course, a part of the garment, but for tying purposes it is as much an essential as is an attractive box for candy. Not only is it impossible in many cases to tie with twine, but an attractive tape marks the goods and gives them a distinction which is particularly desired. There are some manufacturers, finishers and dyers of piece goods who buy a dozen or more separate and distinct patterns of fancy tapes, using different kinds for different customers or only one kind on certain line of work.

Both the wholesaler and the retailer handling these lines would immediately notice the least deviation from the usual patterns of wrapping tape and would question the goods. Substitutes for tying tape have been tried but generally with poor success. There is nothing to take its place, nothing that so distinguishes the goods.

The mill man who spends good money for good tape knows that he could not do without it. The manufacturer who does not figure on this item in his supplies neglects an important feature of successful business—that of putting out an attractive package, and a package that has some individuality.

Here is a seemingly unimportant point which has very probably been overlooked by a number of manufacturers, but one which we think is well worth some consideration.

THE HEILMANN COMBING MACHINE.

Should Be Overhauled Every Six Months. Adjusting the Parts.

BY ARTHUR THORPE.

As the comber is one of the most delicate and complicated machines in a cotton mill, I will try to use plain words and give a few ideas pertaining to it that may help those who do not understand its workings and adjustments.

The comber is used only in mills where an extra good quality of counts is made, and where yarn and cloth of fine texture is manufactured. Its work is to take out all short fibers under the desired length, and neps and dirt that there may still be in the sliver from preceding processes. In order that the machine will do its work thoroughly, it must be set with accuracy and judgment according to grade and kind of cotton being worked. For instance, a comber running Egyptian cotton can not be changed to Sea Island, or vice versa, without changing the settings and timing of motions to suit the difference of staple and weight of lap.

As the comber has six to eight heads it is very important to have all of them set exactly alike in order that each one shall take out the same percentage of waste, and make good piecings and sliver of nice appearance. Each machine should be thoroughly overhauled and re-set at least every six months. The feed roll and detaching roll, (sometimes called delivery roll), should be taken out and cleaned thoroughly and the cushion plates taken off and examined, and if the leather is not in perfect condition it should be taken off and re-covered.

When putting the cushion plate back on the swing frame great care must be exercised, and the best way is to adjust it before replacing the nipper or swing frame back on the machine. A strip of paper should be held between the cushion plate and the nipper knife, and the nipper knife pressed against the cushion plate. If the paper can not be withdrawn it shows that the cotton will be able to stand the pull of the needles as they pass through the fibers that are held by the nipper knife. This strip of paper should be tried all along the cushion plate to be sure the knife will come in contact along the entire length, as excessive waste is caused by good fibers being pulled out by the action of the needles. Another thing to watch is that the inside edge of the nipper knife does not come in contact with the nose of the cushion plate as it will chafe the leather and have a tendency to hold the knife in its upward stroke. The best way to set this is with a narrow strip of paper folded twice and drawn between the nose of the cushion plate and inside edge of the nipper knife. If too loose or if so tight the paper will not slide easily along the surface, adjust it with the small screws on back of the swing frame. Assuming the machine has been cleaned thoroughly, having taken it all apart, leaving cam shaft and cylinder shaft in their bearings, we are now ready to replace the various pieces.

The detaching roll is the first to be replaced—caps put on the bearings and tightened. This roll should work freely

in its bearings. If it runs hard it puts a great strain on the catch and internal gear which drive it. The next move is to see that the segments are in line with detaching roll. Turn the cylinder shaft so the index finger shall point to the figure five on the index wheel. Now take the 1⅛-inch finger gauge and place it between the detaching roll and front edge of the segment on the first head. If the segment is too much forward or too far away from the gauge it must be made to just touch the gauge by loosening it on the shaft and setting to gauge, and then tightening set screw to hold it there. This must be done on each head so as to be sure that all are in line as this affects the appearance of the sliver delivered. When setting the segments glance at the index wheel occasionally to be sure the shaft has not moved in either direction.

Next put in the feed roll which must be in line with the detaching roll. Two inches are the usual distance between the two rolls, which can be set accurately with a pair of callipers used as a gauge.

The setting of the nippers is next, and must be done with great care and accuracy, so that they shall be all set alike and working at the same time. The nipper stands, while setting the nippers, should not be fastened too tight as the stands may have to be moved slightly and can be tapped with a hammer until the correct position is found and all are in line.

The cushion plate is usually set with a 1¼-inch gauge between the nose of the cushion plate and the detaching roll, and must be a good gauge along the full width of the cushion plate, and not tight at one end and loose at the other end, as this would affect the amount of waste taken out.

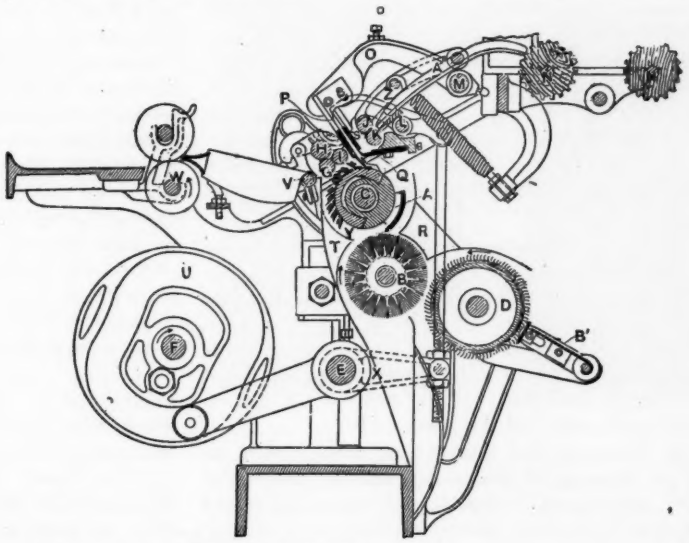
When setting the nippers set it with the screw on the right hand side of the swing frame, leaving the one on the left loose and not in contact with the nipper stand. After getting all the cushion plates in line and set at 1¼-inches, take a strip of paper and place it between the nipper stand and the adjustment screw on the swing frame. Then hold another strip between the stand and screw on the left-hand side, and bring the screw in contact so it will hold the paper when pulled as when both screws hold the paper one knows that both sides are exactly alike and no torsion in the nipper when the machine is running.

When setting the nipper knife to the needles a twenty gauge is generally used. As the segment is supposed to be at the same height as the needles, it is found easier to set with the segment under the nipper. As its surface is smooth it does not wear the gauge, and it prevents the liability of dulling the needle points by the frequent rubbing of the gauge.

The step gauge is also used in setting the nipper by being placed between the nipper stand and the stop screw on the swing frame. The one-quarter-inch step is generally used, and when it is inserted it holds the swing frame in position for setting with gauge to the needles. If the nipper knife is too tight or loose on the gauge it is adjusted with the adjustment screw on top of the nipper stand. This screw controls the movement of the brackets which hold the nipper and can be raised or lowered until the nipper knife is the right distance from the needles. As soon as all the nippers have been set, the lock, or check, nuts, and bolts in the nipper stands should be made tight, as they soon work out of position if left loose. The connecting rods can now be attached to the bracket which hold the nipper knife. The cam shaft must be turned so the nipper cam bowl is at the highest point. The step gauge is now placed between the nipper stand and the stop screw, and the connecting rod is fastened to hold it in this position by the nuts on the bottom of the rod. After all rods have been connected and set to the step gauge, the gauge should be tried on each head to be sure that all are set exactly alike. As nippers are set with the segment under the knife, the twenty-gauge should be tried with the needles under the nipper. Turn the balance wheel so that the first row of needles shall come under the nipper knife and pass the gauge between them. If in case a high place is found raise the nipper to clear the high point. Try each row of needles in this way by bringing it under the nipper knife, as a high strip of needles will be found occasionally, and the nipper must be set to the highest points on the cylinder.

REFERENCES.

A—Fluted Segment.
B—Brush.
C—Cylinder.
D—Doffer.
E—Nipper Shaft.
F—Cam Shaft.
G—Steel Drawing off or Detaching Roll.
H—Brass Clearing Roll.
I—Leather Drawing-off Roll.
J—Top Feed Roll.
K—Bottom Feed Roll
L—Nipper Arm Fulcrum.
M—Top Comb Shaft.
N—Lap Roll Shaft.
O—Top Comb Arm.
P—Top Comb.
Q—Cushion Plate.
R—Doffer Cover.
S—Nipper Knife.
T—Waste Chute.
U—Nipper Cam.
V—Horse-Tail Holder Shaft.
W—Calender Roll Shaft.
X—Nipper Shaft Lever.
Y—Half Lap.
Z—Top Feed Roll Saddle.
A′—Lap Plate.
B′—Waste Packer.



SECTION OF A COMBING MACHINE.

The top comb setting is now to be gone over. When setting, the segment should be under the comb, and the cam on the cylinder shaft should be so the comb is at its lowest point. This should be when the index finger is at six on the index wheel. The angle at which the top comb is set depends upon the amount of waste to be taken out; the greater angle given takes out more waste and vice versa. Twenty and twenty-eight degrees is the angle mostly used. A 20-gauge is generally used to set the comb to the segment, and it is adjusted to the gauge with set screws on the top of the comb bracket. All lock nuts should be securely fastened as the comb will be damaged if the segment comes in contact with the needle points. The top combs should be down when the index finger is at six but can be varied according to the amount of waste to be taken out.

Another important feature is the setting of the leather detaching rolls to the lifter brackets. Have the index finger at seven and at this point the lifter cam bowl should be at the lowest point with the roll touching the segment. It should be so a 26-gauge will go between the lifter bracket and bush on the leather roll. If tight or loose it can be adjusted by the small set screw on the back of the lifter bracket. Try the gauge on each end of every roll as all must be set alike. As good piecing depends upon the timing of the lifter brackets or lifter motion, the cam should be at the lowest point, or at 6¾ on the index wheel, as this is the point the detaching roll starts to move forward.

The brush which takes the waste from the cylinder must also be looked after, and set so the bristles will touch the brass to insure good cleaning. It must be in perfect line and free in its bearings.

The doffer and brush are set just close enough together not to touch each other. A good idea is to be able to get a card gauge between them. If the doffer is too close to the brush it will wear off the bristle ends.

I think I have covered the most important points regarding the resetting of the comber, but the gauges and timing of motions can be varied according to the classes of work, staple of cotton, amount of waste, etc.

There are many points about a comber to be watched closely, such as the top combs should be examined at least every week as combs with needles broken out, and needles with hooked points, must be taken out and replaced with new ones to produce good work. Also leather detaching rolls must be examined occasionally, as loose cover and scabs, caused by varnish peeling off, will produce uneven and curly sliver. The cylinders should be examined and picked daily to keep the needles in good condition, and slugs removed which the brush fails to take out. The draw-box should be cleaned and oiled periodically to prevent cut and uneven sliver.

Cleanliness has a great deal to do with the running of the combers. If the machine is allowed to get dirty, especially in front, it will run bad as the fly will gather on the delivery and the feed rolls, and when the web of sliver comes in contact with this fly it will cause the end to break down.

I will not discuss draft, production, and percentage of waste as no doubt the reader is accustomed to these calculations and how to obtain the desired results.

As this is my first article written for publication I hope it will be received favorably and thoroughly understood.

TROUBLES CAUSED BY NITS, OR NEPS IN SLASHING AND WEAVING.

BY JAMES BREWSTER.

There are several difficulties in the slashing and weaving room which the slasher tender and weaver have to contend with, and which are not realized as much as they ought to be. Among the troubles are nits, or neps, in the yarn.

These nits, or neps, in the yarn are caused by wrong settings in the rickers or the cards, or poor cotton, or all three combined. Once in the yarn, there is trouble for the slasher tender and weaver until the yarn is used up, the result being poor looking cloth, not only by the appearance of the nits, but because many other imperfections of which these nits are indirectly the cause.

The trouble in the slashing room is that, when the yarn is going through the size-box, the nits in the yarn take up a larger quantity of size than the thread itself, and while being dried on the cylinders those on one thread get baked fast onto the threads on either side of it. When these threads come to the separating rods, they break apart and run onto other threads in the same lease and dent, and when a few of them have been broken it will make an uneven or ragged sheet of warp yarn. The slasher tender seeing a ragged sheet, tries to straighten it out, but when it is being woven, and the place reached where the warp has been apparently straightened the threads are found crossed at the lease rods and in most cases, breaking the yarn.

One might say that the slasher tender should not straighten the yarn, except when he is starting a new warp. This would be the proper thing to do, but there are cases —not exceptional, but quite often where there is nitty or neppy yarn—when one thread breaks and goes into a dent about a half an inch from its original dent, and if this was not rectified at once the thread which is crossed would break several others, which would be worse than straightening the thread. There are times when several threads break and run along with another thread in its original dent, but under the wrong separating rod, many of which the slasher tender may not see. The weaver, besides having the trouble of crossed threads, and threads which have been broken while slashing, still has the trouble of the nits to contend with.

Another of the troubles are filling kinks in the cloth. These kinks are sometimes caused by nitty yarn, especially in cloths for which a small shed is required, and fine filling used. When the shed opens, the warp threads get hooked to a nit of the opposite shed, thus making a kink and with fine filling it would be impractical to put sufficient tension on the filling to pull the kink out, as the filling would be continually breaking, which is very detrimental to good cloth. The nits not allowing some of the threads to separate properly when shedding, cause the shuttle to break the threads while picking. Thus there is extra work for slasher tender and considerably more work for weaver, besides making a poor looking cloth which is caused directly or indirectly by nits in the yarn.

Concerning the action of dyes upon the wool fibers the dyes themselves have a much less effect than the mordants and other bodies used to modify and fasten them.

WOOL MANUFACTURING.

THE USE OF COTTON IN THE WOOLEN MILL.

How to Obtain the Best Possible Results.

BY O. F. IRELAND.

PART I.

The time was when the use of cotton as a substitute in the manufacture of woolen goods was considered as something of a trick to deceive the buyer, who might be led to think he was securing an all wool fabric at a bargain, when the secret of the low price lay in the cotton employed in its construction. Even in the mill, the work was often attended with certain precautions and an air of mystery, in the endeavor to conceal the fact that any cotton ever entered the works.

The writer recalls his first experience in this line of work, where the company had a special storehouse out in a field, in the edge of the woods, which was supposed to be used only for waste, and here the cotton was stored, and cautiously delivered to the mill under the cover of darkness, that it might not be noised abroad that they were practicing deception. The time has long since come, however, when there is no secrecy regarding the use of cotton by the woolen manufacturer; in fact, there can be none, for the buyer has learned how to detect the adulteration, and by the well-known "boiling out" process, can discover, not only the presence of cotton, but can tell to something of a nicety the percentage employed, so as to know pretty nearly what he is getting for his money.

Not only this, but the manufacturer no longer thinks to deceive, nor are his methods looked upon with the old time suspicion; for the use of cotton in combination with the wool fiber in the manufacture of the so-called union or cotton carded fabrics, has become a legitimate means of meeting the demands of a great class of consumers, who can not afford to wear clothing made from strictly all wool stock, and to whom the cheaper cloth is a great boon.

The demand for medium and low-priced goods is met by the use of various kinds and grades of substitutes, but in this article we propose to speak more particularly of the use of cotton, and the best method of handling it in order to get the best results.

Many who have made a study of the combination of wool and cotton, have succeeded remarkably well in bringing out really desirable fabrics, while others who have made the attempt have made miserable failures, because of the lack of a knowledge of certain points that are essential to success.

The extreme difference in the nature of the two fibers, —one being an animal and the other a vegetable substance, accounts for much of the difficulty arising from their combination.

An entirely different set of formulas for dyeing are required, and even then, it is impossible to secure colors on cotton that will stand the test of fulling and scouring equal to those given the wool.

Then again, there is no fulling capacity in the cotton fiber, and its use means a sacrifice of a certain amount of firmness that characterizes the felted woolen cloth, and almost always a variation in the construction or lay-out of the work in the weaving.

While much of the trouble coming to those who are inexperienced in this line of work is developed in the finishing department, it is true that in many cases the real difficulty must be looked for and corrected elsewhere, and not infrequently in the very initiation of the work. It is quite possible to imitate an all-wool cassimere by the use of a cotton mixture, that will very closely resemble the original when it comes from the loom; but when it comes to be finished it may be very wide of the mark, in spite of the finisher's best endeavors. If the colors have not been properly made, tested and matched, there is danger of faded effects, stains and clouds; while a failure

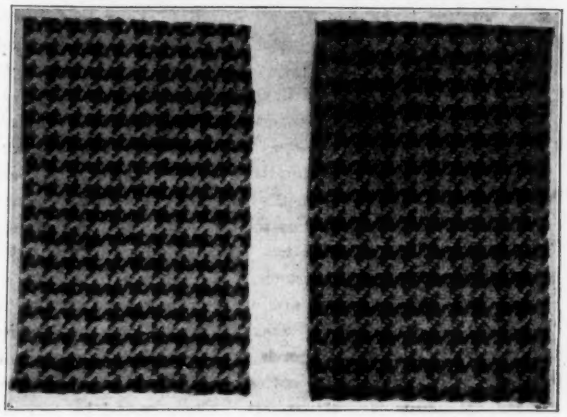


FIG. 1. FIG. 2.

to construct the cloth properly may result in a cloth that will run up against an impossibility in the fulling process.

While these things may occur, and the finisher be blameless, it is equally true that serious trouble may occur if the finisher seeks to follow out the same line of procedure on cotton mixtures that he would in handling all-wool cloths.

As illustrations, we will call attention to two instances that came under the observation of the writer in his experience with this class of work. We were making a line of fancy cassimeres having forty per cent. of cotton in their make-up. The mill had orders for more than they could make, and the selling agents gave orders that we furnish the details of construction and give samples of all colors used in a neighboring mill, that they might help to fill the orders secured. This we did, but, of course, we could not vouch for the results under an entirely different management. The dyer might not get the colors as fast, and the finisher might not be sufficiently skilful upon this class of work as the case required, and we could only leave it in their hands, after giving all the information we could.

Not long after this we were requested to go to the mill to ascertain why the work did not come out like our own. We did this, and found a bad mess of it. The goods were off shade in many instances, and withal were very badly stained and cloudy. We did not know how the col-

ors were made, and had no means of judging of that part of the work; but we could see that the goods were handled in the finishing room the same as though they were all wool, which was decidedly wrong.

The accompanying illustrations show two samples of black and white checks containing exactly the same amount of cotton (40 per cent.), made and finished under different managements. No. 1 shows the white clear and desirable, while No. 2 is stained from lack of proper treatment.

The second case was one where the writer was asked to explain why the finisher did not get good results upon a certain line of work.

When it came to the fulling process it was impossible to make it full to the required width. The cloth was laid in the loom so that it required twelve inches to full, and after fulling about three or four inches it would refuse to "budge" another inch, and the white and many of the lighter shades that should have been clear, were badly stained from the bleeding of the colors from the darker shades. We concluded at once, and rightfully, that the stock was too largely of a non-felting character to full the width required by the lay-out. After testing them to find how much we could full them, and still retain the colors, we discovered that after fulling about two inches they began to stain and to stop fulling, and we decided to finish them up at ten inches over width; concluding that the extra width with good colors was better than the correct width with the colors ruined. In this opinion the owner acquiesced when we told him that his finisher had not been at fault; but the construction of the cloth was not right for the character of the stock.

Before leaving the place we had an opportunity to slip into the mixing room when they were preparing a lot of filling for this lot of goods, and we found it was composed of 75 per cent. of cotton and 25 per cent. of card waste, including card strippings. There would be scarcely any loss to the cotton, while it is fair to say such waste would shrink at least 30 per cent., so that the real percentage of wool, with the dirt and grease out, would be about 16½ per cent., and that the poorest and deadest stock on the premises; and the goods laid the same width that would be suitable for a good wool cheviot or cassimere—67 inches.

We cite these cases to show how mistakes are made by those who attempt to make cotton mixed goods without considering the difference in the character of the two kinds of stock.

Aside from the matter of dyeing and finishing and the proper construction of the cloth, there are other points of importance, such as the selection of stock, matching of colors to avoid trouble, mixing, etc., which we hope to take up with the reader later on.

We shall confine ourselves to such goods as fancy cassimeres, as they contain a greater variety of colors, and usually a necessity for greater care; and the rules that will apply to these are nearly always applicable to any cotton mixed cloth.

In no other work is the old adage more appropriate;—"Be sure you are right, then go ahead."

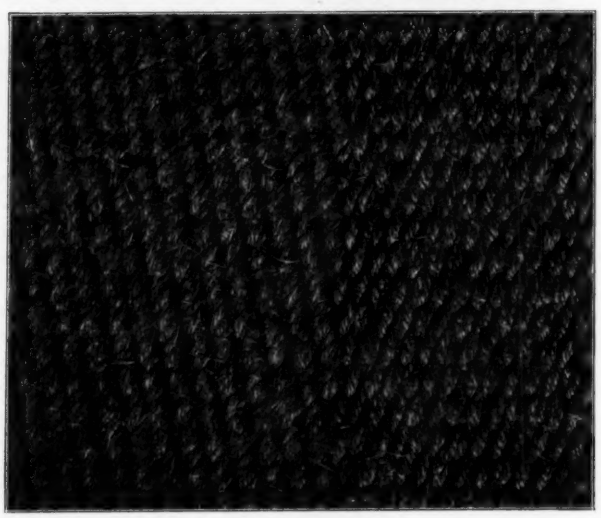
The total value of all farm products of 1908 reaches the most extraordinary amount in the world's history—$7,778,000,000.

PRESS CLOTH USED IN OIL MILLS.

IMPORT DUTIES ON THE STAPLE AND ITS MANUFACTURE. OPINIONS OF THOSE USING THE CLOTH. CAMEL'S HAIR IS GENERALLY PREFERRED. HOW WOVEN.

The manufacture of press cloth from camel's hair is something that has developed since the present customs tariff came into being eleven years ago, and consequently was little thought of at that time.

Prior to 1897, when the present law was enacted, cloth for the expression of oil from seed, cottonseed for example, was manufactured only from horse hair, and the duty imposed upon the imported article was made at 20 cents per square yard, as noted in paragraph 431 of the tariff act. Camel's hair was then scarcely thought of as a fiber for cloth of this kind. This is one of the anomalies that are developed in all tariff laws brought about by the changes that are made in industrial pursuits, or the vicissitudes which are likely to occur during any period of rapidly occuring innovations.



CAMEL'S HAIR PRESS CLOTH.

As the law now stands camel's-hair cloth can not be imported under any other paragraph of the tariff than number 366, which may be termed the omnibus clause, which subjects this manufacture to a rate of 33 cents a pound and 50 per cent. ad valorem, as a minimum, instead of 20 cents a square yard, as noted above, for the manufactures from horse hair.

The grade of camel's hair used for press cloth is known in the tariff as Russian camel's hair, and is subject to a duty of 4 cents per pound if valued at 12 cents or less per pound, and 7 cents a pound if valued at exceeding 12 cents per pound, the same as wools that are imported for the manufacture of carpets. Russian camel's hair is the lowest grade of this material that is imported, the better grade being known as Chinese camel's hair, which is better in grade simply because it is more carefully handled and the coarser fibers extracted. Some of the hair that is imported for the manufacture of press cloth, however, is of a sort that can be used without much difficulty in the manufacture of ladies' dress goods of a medium quality.

Because of the apparent interest that has been shown, of late, in the manufacture of press cloth, we have obtained the opinions of a number of users of it with particular reference as to their preferences concerning the material of which it is made, whether camel's hair or horse hair, or wool.

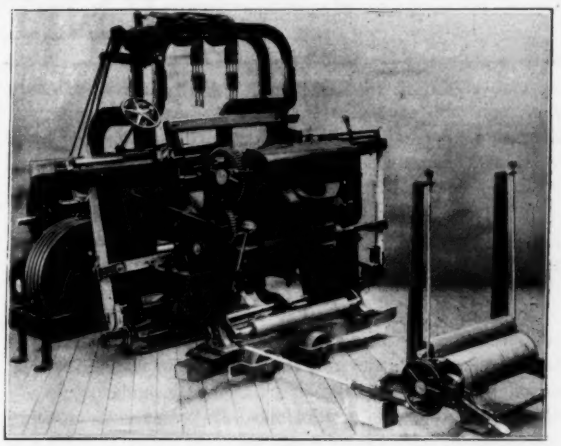
Chas. E. Perkins, president and treasurer of the J. T. Perkins Co., Brooklyn, N. Y., writes us as follows: "Camel's hair such as we put into yarn for the manufacture of camel's hair press cloth comes from Russia and nothing but the longest and best hair can be used for this cloth, such as the cottonseed oil manufacturers require, as a pressure of 4,000 pounds per square inch is commonly used. It can not contain oils or waste, as that would lessen the strength materially. Sheep's wool makes a stronger fabric than camel's hair, provided the best wool, such as comes from the Pyrenees Mountains in Spain, is used, but there are some properties possessed by camel's hair that makes it superior as a fiber for press cloth used in cottonseed oil mills. The horse hair question is a very different proposition. We presume the horse hair used for press cloth comes largely from South America and is manufactured into a cloth which can be purchased in the running yard by a mill in New Orleans."

J. C. Hamilton, manager of the Capital City Oil Co., Baton Rouge, La., writes us as follows: "Camel's hair press cloth is preferable, because, after years of experience, it has been found the best suited for the high pressure required to get the oil from the seed. My own experience dates from 1875, and during the intervening time my father and I have tried nearly every material of which press cloth is made. I have heard of two oil mills which claim to have made a success using horse hair cloth and claim it is more economical than that made of camel's hair. As horse hair is much thicker than camel's hair it can not be used so successfully in the same boxes, unless there be ample clearance in the latter, and then the item of repairing the horse hair cloth is very difficult."

E. B. Nuzum, of the Tuscaloosa Cottonseed Oil Company, Tuscaloosa, Ala., writes us as follows: "We prefer camel's hair press cloth on account of its strength and elasticity. Camel's hair for press cloth comes mostly from Asia, in its original condition. The best cloth does not contain waste or adulteration of any kind. It has to be perfect to stand the great strain to which it is subjected. Horse hair press cloth—made of tails and manes—is very strong and makes good cloth, but it is very stiff, and I think the cost is greater than that made of camel's hair.

In the testimony of John S. Radford, manager of the Oriental Textile Mills, Houston, Texas, before the ways and means committee, house of representatives, Washington, D. C., the following statements are made:

"Camel's hair is a wool, possessing the physiological properties of wool, a combing wool, and worked by the identical processes and machinery as is sheep's wool. It competes with sheep's wool in the markets of the world and is manufactured into yarns and cloth to compete with sheep's wool, yarn, cloth, clothing, rugs, etc. The statement that camel's hair is the only fabric out of which press cloth is made is entirely incorrect, there being in use, and manufactured in the United States, press cloth of sheep's wool, which is preferred by some to that of camel's wool, and we have made and sold lots of it. Horse hair press cloth is, and has been since we have been in business, manufactured in the city of New Orleans, La., and sold to the cottonseed oil mills right along, and preferred by quite a number to any other; is sold at a price generally exceeding, never less within our knowledge, than camel's hair cloth, though horse hair is on the free list. Horse hair press cloth is manufactured abroad, as well as here, necessarily in heavy weights, and horse hair being admitted free, there is just enough duty fixed on the imported article at 20 cents per square yard to protect American labor against the miserable conditions in Europe. Horse hair press cloth is freely offered to and used by the cottonseed oil mills. We are paying at this time about



HEAVY PRESS CLOTH LOOM.
Crompton & Knowles Loom Works, Worcester, Mass.

18½ cents per pound for Russian camel's hair delivered in our warehouse, and we are forced to purchase practically a year's supply at a time. We are enabled to convert only about 42 to 45 per cent. of this camel's hair into press cloth. There is about 40 per cent. dead loss in dirt, vegetable matter, etc., and the balance in flyings, noil and thread waste. We now pay 4 cents per pound duty on the camel's hair in its original condition; the last noil sold netted us about 12 cents per pound and thread waste about 8 cents per pound; it costs about 14 cents per pound to manufacture. Our manufacture of camel's hair press cloth nets us, after the cost of packing, conditioning, and agent's selling commission, about 57 cents per pound on a present invoicing price of 60 and 61 cents per pound.

Col. Jo Allison, Ennis, Texas, testified before the house of representatives' committee on ways and means, to the effect that wool press cloth is absolutely unfit for the expression of oil from cottonseed. He said that in his experience he had used it over and over again and it had proved a failure.

Because of the importance that is now attached to this kind of manufacture, it may be well to illustrate and describe as of collateral interest, the loom upon which the cloth is woven. The loom is necessarily of heavy construction. It has a single box or plain lay, accommodating an extra large shuttle, and the four harnesses are operated by side cams and bow jacks with angle levers on the arches, carrying the heavy chain harness connections over the sheaves. This allows either a plain or twill weave, as desired, and single web or two-ply goods. The let-off is quite similar to that employed on Crompton & Knowles duck looms, the warp beam being geared into a pinion

friction shaft underneath, the tension of which is regulated and controlled by the weaver from the front of the loom. A hand wheel, also at the front, allows the beam to be turned either way by hand when desired. The warp passes from the beam between adjustable tension bars in place of back rolls. The take-up mechanism, owing to the extraordinary thickness of the woven goods, is a departure from the more familiar arrangements. There are two spike rolls and two lower rolls in the loom itself, and from these the cloth passes under a slightly raised platform or bridge to a set of rolls in an independent frame behind the weaver. The cloth roll rises in guides as the goods are wound, and, in spite of its necessarily large diameter, interferes in no manner with the weaver in his work at the loom. These looms are built 24", 26", 34" and 38" in width between the swords.

Over-chromed wool takes on a yellowish gray color, turns harsh and rough to the touch, and generally handles poor and thin.

KNITTING

WHEN IS HOSIERY YARN BAD?

Entering of the Yarn into the Needles. Effect of a Knot or an Obstruction. How Some Defects Are Made.

by ernest tompkins.

PART II

It should be recalled that where the yarn leaves the bobbin it travels a circular path whereby it is given a twisting motion up to the time that it is constrained by the blades and the needles. Consequently, ends projecting from a knot circles around the yarn apparently looking for trouble. If these ends are long they may whip under the guide just before the knot gets through the hole and they may be caught by the nibs and forced up between the needles. Since there are generally two ends thus caught the single yarn is broken in the hole and travels outside of it, the machine frequently running without any interruption. To the uninitiated this is the accomplishment of an impossibility—yarn getting out of the hole in an iron guide without breaking either the yarn or the guide. This trouble, however, can not be charged to the yarn as it may be overcome at the knitting machine by putting a guard on the guide, and in any case it should be overcome in the rewinding by trimming the knots closely. This same trouble may be caused by the end of a kink whipping under the guide and between the blades and the needles, but inasmuch as it can be overcome by a slight change in the machine no real complaint should be made against the yarn for this trouble from kinks.

The yarn has been traced so far up to the needles. Figure 4 shows it entering the needles and traveling in them a short distance. It will be observed that after the yarn goes through the small hole in the guide it bridges a gap, the needles being omitted from the drawing at this place so that the gap may be seen. Next the blades press the yarn against the needles inward,—toward the reader,—and upward under the beards leaving the yarn looped at the heads of the needles. It should be observed that since this view is from the inside of the needle cylinder that the motion of the needles is from right to left, the sinker bur revolving accordingly, as it is driven by the pressure of the needles against the blades. The yarn is not sunk to the full depth of the stitch until it reaches the third or fourth needle space from the entrance, consequently it drags over the first entering blades at a considerable rate of speed, over the next ones at a lesser rate, and so on until the full depth of the stitch is obtained. Then it travels at the same rate as the blades until they recede in succession leaving the yarn in the needles and traveling at their rate.

Taking sixty revolutions per minute of a 20-inch cylinder as a fair average speed the velocity of the yarn between the bobbin and the needles is 787 feet per minute. After it leaves the guide and before it touches the needles it slides over the bur just above the nibs; its rate of travel across the blades being 472 feet per minute since the blades are traveling at the rate of 315 feet per minute. It may be understood from this how a knot or other obstruction in the yarn may throw it upward or downward causing a drop stitch. At the entrance of the yarn into the needles its velocity over the blades of 472 feet per minute begins to decrease until it vanishes when the depth of the stitch is obtained. After that it travels at the velocity of the blades in the needles, which is a little greater than that of the needles owing to the fact that the yarn is being fed upward under the beards. The actual rate is 445 feet per minute. When the blades leave the stitches in the needles they, of course, travel at the needle velocity, which is 315 feet per minute.

The preceding figures make it evident that an obstruction on the yarn has to travel over the entering blade at a high rate of speed, which speed decreases with succeeding blades until the full depth is attained; consequently it is remarkable that as many obstructions as do, pass along that route without causing trouble. It has been shown before that deflection of the yarn upward or downward beyond a small range will cause a drop stitch or stitches by allowing it to get up over the beards of the needles or off of the nibs. Figure 4 shows how narrow this range is. Moreover, the work of drawing the yarn off of the bobbin and sinking the stitch is transmitted from the bur by the blades through the needles thence to the driving mechanism of the machine. In other words, the work is transmitted through the needles causing them to bend backward from the direction of their motion. If the needles are overloaded they will be bent back so far that the entering blade will interfere with the needles causing what is called "over-reaching," the result of which is that, generally, beards are broken off and the blades roughened. A considerable pull on the yarn will have the same effect. Of course, when the beards are broken off stitches are dropped causing a defect in the cloth. In addition to this bending of the needles backward in the line of motion there is an inward bending caused by the pressure of the yarn due to drawing of the stitch. Consequently, a pull on the yarn will bend the needles backward, shortening the stitch. Also, a heavy place in the yarn will necessitate more work in sinking the stitch; consequently this heavy place will force the needles inward unduly.

This inward bending of the needle, due to heavy places in the yarn, is one of the defects of the domestic spring needle machine. Various devices have been made to overcome it, some of them being quite successful. They are not in general use, however, as the knit-goods consumers of America are not yet sufficiently discriminating to object to the defect. Indeed, it is generally blamed on the yarn to which, of course, the initial blame is due, but the trouble is aggravated by the bending of the needle and this aggravation is properly chargeable to the machine. When the yarn is uneven—within short distances—the needle is long and the bur is large; that is, when the combination is about as unfavorable as generally occurs, the cloth will be what is called "cloudy." This is especially noticeable when it is held up so that the light shows through it. It will be noticed that where the yarn is fine the stitches are disproportionately longer than where the yarn is heavy. This cloudy effect is reduced somewhat by washing and boarding so that it is not generally very noticeable in the finished garment. Close examination, however, will reveal it in almost any domestic knitting.

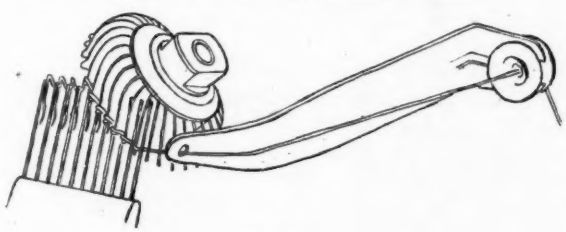


FIG. 4.

In connection with this matter the following incident may not be out of place: The foreman of a knitting room approached a knitting machine manufacturer and said "I understand that you buy inventions and I would like you to suggest a needed improvement in knitting machinery, as I believe I can invent something." The manufacturer replied "Devise a practical means of springing the needles into the bur when the yarn comes heavy." The knitter reflected a moment and then said: "That would be the reverse of what happens now, would it not?" The manufacturer answered "yes." The knitter again reflected and then said "Well, I give that up at the start."

If the machine is being operated with a tight stitch, a pull or a heavy place in the yarn may, by forcing the needles back, make the stitch so much tighter that the yarn will be broken in the following operations, making a hole in the cloth. Tender yarn is likely to pull apart when being forced between the needles. It should be noticed that in every needle space the blade and two thicknesses of yarn have to enter. Moreover, the blades enter obliquely owing to the radial cuts of the bur. Consequently, there is a maximum limit to the weight of yarn that may be used on any given gage. Heavier yarn could not be crowded into the needles. If, therefore, the machine is being operated with the maximum weight of yarn for the gage and a heavy end runs in, the needles will be crowded back so much that damage to the machine and fabric is almost certain. If, however, the machine is being operated with yarn lighter than the maximum then a heavy place within the maximum limit is likely to be knit in without any trouble. Here is the explanation of a question that has perplexed many spinners. One knitter may be using yarn with heavy ends and be getting along all right. Another knitter with that same kind of yarn is having trouble owing to the heavy ends. The chances are that the one knitter is operating his machines with a longer stitch or a coarser gage, consequently they will stand an overload of yarn. The other knitter is operating his machines with a tight stitch or a fine gage, and when the heavy end comes it causes a "smash," as it is called. This in itself might appear to be trivial, meaning no more than a hole in the fabric, a few needles to replace and a little time lost, but a succession of smashes on the different machines through the knitting room will roughen the burs, spoil the needle alignment and disorganize the help so that the consequences may be serious almost beyond imagination.

When the guide was under discussion it was stated that kinks in the yarn caused trouble after they passed through the guide. A glance at Figure 4 will make it evident how they could cause trouble when being fed up under the beards of the needles. A kink is a twisted doubling of the yarn. When entering the needles it lies back along the yarn making it three-ply with a loop at the trailing end. It is evident that this means a temporary overload of 200 per cent. with the added danger of the loop catching somewhere and making trouble. If the yarn is very kinky, especially when heavy yarn or a tight stitch is being used, it may be impractical to run it except, of course, by reducing the kinks as may be done by such methods as steaming the yarn, saturating it with an emulsion, dampening it by packing it between wet cloths, or leaving it in a damp atmosphere. Really, every knitting room should be equipped with humidifiers; whereas in practice comparatively few of them are so equipped. It is probable that much yarn is condemned in the knitting room when the fault is with the atmosphere in the room instead of with the yarn, because that atmosphere may be so dry that it will take out of the yarn the moisture that properly belongs in it.

The trouble caused by kinky yarn increases as the speed of the yarn decreases. At sustained high speed the tension is sufficient to overcome the tendency of the yarn to kink. It would follow then that if high speed could be maintained without interruption even very hard twisted yarn could be knit without trouble from kinks. But stoppage is necessary for the replacement of needles, for cutting out the cloth, for oiling, and generally for replacing the bobbins; and high speed is not always permissible. In some mills however, two sets of bobbins are kept on the machine with the yarn already tied so that when a bobbin in the first set is run off it continues to run from the corresponding bobbin in the second set. This method if practiced with care increases the production of the machine to an appreciable extent and decreases the trouble arising from kinks running into the machine. In some cases when the yarn is very kinky and the cylinder has been stopped, three or four knitters will get around the stopped cylinder and each man will hook one finger of each hand under one of the threads thus drawing out the slack. Since one man can take care of only two threads this requires to hold the yarn three men for a six feed cylinder. Another is required to pull out the shipper. After that there is not much danger from the kinks until the machine has to be started again.

A rather interesting incident in this line occurred when some Chinamen were watching a demonstration of an American knitting machine. They were principally inter-

ested in the making of fleece goods and the demonstration was arranged with that idea and was successful. They then wanted to see the machine run on single thread flat work. There was no yarn at hand for this purpose since the fleece goods are made with a two-thread face, but the demonstrator sent a messenger to a neighboring yarn mill and procured a couple of cones of the right weight of yarn. He tied it into the machine in the presence of the Chinamen, but it kinked so badly that the demonstration promised to condemn the machine. The demonstrator was in a quandary. To acknowledge that the machine would not knit the yarn would have been disastrous and to postpone the demonstration would have been nearly as bad. He

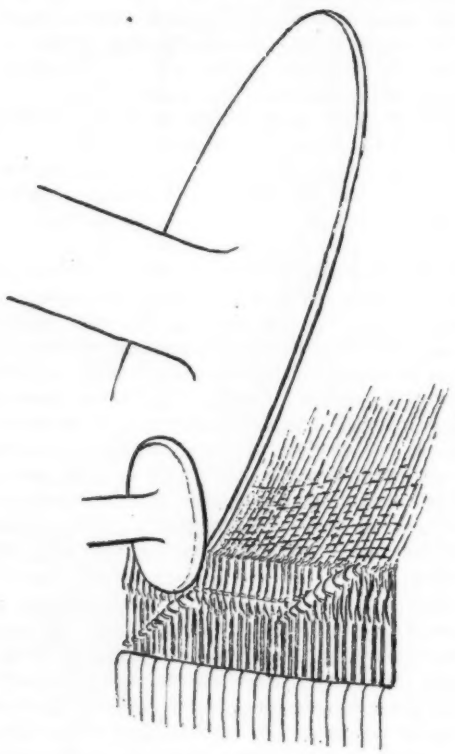


FIG. 5. SEE APRIL ISSUE.

concluded, therefore, to take the chance of running the machine at an extremely high rate of speed. If he could get the speed high enough to prevent the formation of the kinks he knew that it would run successfully, but if a few of them did form at the high rate of speed the damage would be serious. While the Chinamen were conversing among themselves in their own language, evidently thinking that the machine was not equal to the occasion, the demonstrator changed the pulley, threw on the belt and then quickly pulled out the shifter. The cylinder started to revolve at a rapidly increasing rate until it reached a speed that made the spectators open their eyes and back away from it. They watched it in amazement evidently expecting a serious mishap at any moment, but the mishap did not occur and the machine continued to run without stopping until they stated that they had seen sufficient and were highly pleased. It is well known that some manufacturers of knit-goods have advocated high speed soon after the installation of a yarn plant. There are people so unkind as to state that the yarn was so kinky that they had to speed up the knitting machines before they could use it.

A STOP MOTION FOR A CIRCULAR KNITTING MACHINE.

The stop motion here shown relates particularly to circular knitting machines in which relatively fixed bobbins are employed, and consists in improved mechanism whereby the machine will be promptly stopped automatically either by the failure of the thread, by undue tautness of the same, or when bunches or knots occur.

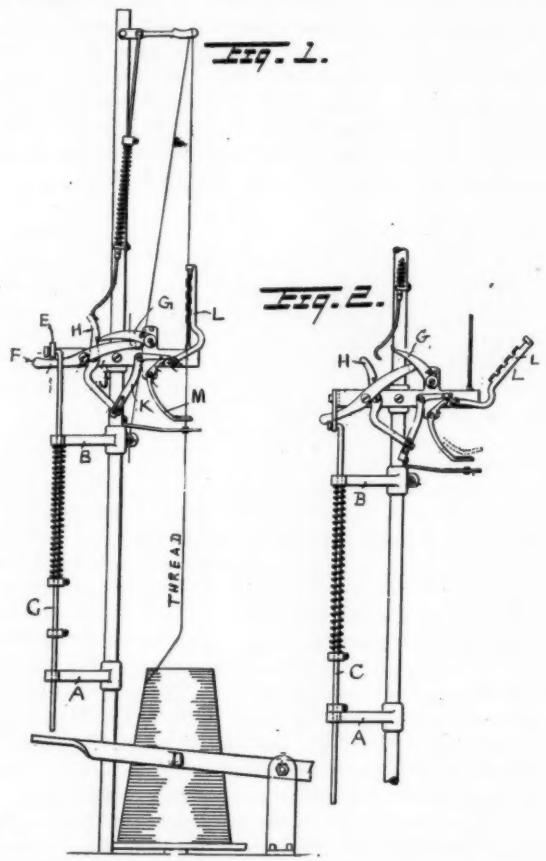


Fig. 1 shows the stop-motion mechanism in connection with the fixed bobbin, the parts being represented in normal operative position. Fig. 2 is a fragmentary view corresponding with Fig. 1, but indicating the position the parts assume when operated by the failure or tightening of the thread.

The stop-motion attachment is carried by a standard secured to the machine frame adjacent to the bobbin post. To this standard are secured brackets *A* and *B* which serve as guides for a vertically movable stop or hammer-rod *C* arranged directly above the end of the stop-motion lever *D*, so that the descent of the hammer-rod, actuated by a spring, will depress the end of the lever for the purpose of operating the belt-shifter and a detent. The upper end of the hammer-rod is connected to the outer end of a pivoted by a hammer-rod lever *F*, pivoted to a bracket on the stand-arm *E*, which arm is normally held in an elevated position

ard; this lever being supported by a trigger mechanism which is automatically operated by the thread from the bobbin.

The inner end of the lever *F* is normally depressed to raise the hammer-rod *C*, by means of a trigger-engaging arm *G* the free end of which is held by the notched trigger *H*. This trigger has an arm *J* which is engaged by a trigger-operating trip lever *K*, one arm of which as shown, is arranged in the path of two tripping fingers arranged to engage the thread,—namely the feeler-finger *L*, and the knot-finger *M*. The feeler-finger is of ordinary construction, being pivoted and normally held in a vertical position by the thread. The knot-finger is provided with a tripping-projection which, like the similar projection of the feeler-finger, is normally located in close proximity to the arm of the trigger-operating lever *K* so that an upward movement of the thread engaging end of the knot-finger will swing this lever in the same manner as does the fall of the feeler-finger *L* (see Fig. 2) so as to in either case release the trigger *H* and permit the fall of the hammer-rod *C*.

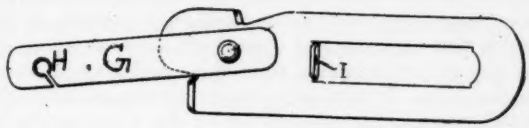


Fig. 2

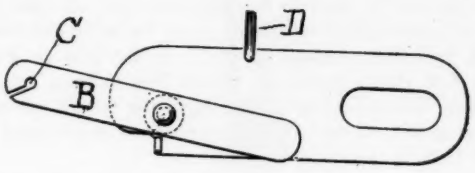


Fig. 3

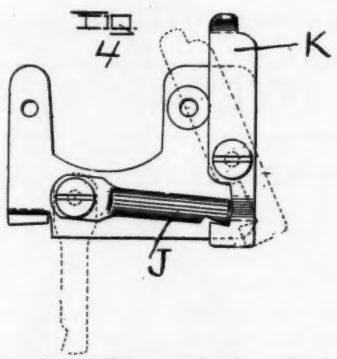


Fig. 4

THREAD-CONTROLLED STOP-MOTION.

The principal object of the mechanism here illustrated is to insure the stopping of a circular knitting machine upon the breaking of one of the feed threads. And more specifically the object is to induce, upon the breaking of one of the feed threads, operation of an automatically-operating belt-shifting mechanism, indirectly through the mechanism whereby such release is accomplished by means of a detector-finger engaging the knitted web.

Figure 1 is a view in perspective of a portion of a circular knitting machine showing the stop-motion mechanism attached thereto. Fig. 2 is a view in side elevation of one of the thread-supported latch-operating fingers, and the support for the same. Fig. 3 is a view in side elevation of the other thread-supported latch-operating finger. Fig. 4 is a view in front elevation of the trip for inducing the release of the belt-shifting mechanism, the latch for supporting the trip, and the plate upon which both are mounted, adapted to be attached to the needle cylinder.

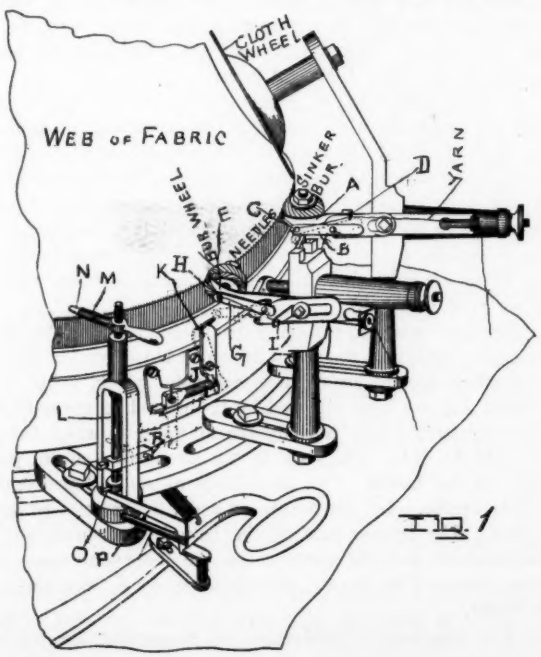


Fig. 1

In advance of the stationary thread-guide *A* is a movable thread-guiding finger *B*, pivoted upon a supporting bracket having in its inner eye a thread-receiving eye, the thread passing to this eye from the fixed eye *D*, located somewhat above the pivot of said finger. So long as the thread remains under tension, the inner end of the finger *B* will be supported thereby in a raised position, as shown by solid lines in Fig. 1. When, however, the tension on the thread is relieved, as by the breaking of the thread, the finger will at once drop to the position indicated by dotted lines.

In advance of this stand is another stand, mounted upon the ring, or bed, upon which stand is supported a bur-wheel, which may be any known kind of thread-feeding wheel; as for example, what is known as a backing-wheel for supplying to the needles a backing yarn, or thread, in the manufacture of plush knitted fabrics.

The thread, or yarn, is supplied to this wheel directly from a stationary thread-guide.

In advance of the stationary thread-guide *E*, is a movable thread-guiding finger *G*, having in its inner end a thread-receiving eye *H* the thread passing to this eye from a fixed eye *I*, which is so located that so long as the thread remains under tension, the inner end of the finger will be supported thereby in a raised position, as shown by solid lines in Fig. 1. When, however, the tension on the thread, is relieved, as by the breaking of the thread, the finger will at once drop to the position indicated by dotted lines.

Mounted upon the periphery of the cylinder is a trip *J* and latch *K* adapted to be carried by the rotating cylinder

past the several bur-wheels and thread-guides. The latch when supporting the trip in horizontal position, is so located that its upper end passes just below the plane of the movable thread-guides when these guides are in their raised position, as when supported by the respective threads under tension. But when either of the thread-guides is permitted to drop to the position indicated by dotted lines in Fig. 1, it will thereby be brought into the path of the upper end of the latch so that the latter can not pass the dropped thread-guide without engaging the same and being moved from the position shown by dotted lines in Figs. 1 and 4 to that indicated by dotted lines in these figures, in which dotted position of the latch the trip is released and permitted to drop to a vertical position, as indicated by dotted lines in these figures.

The stop-motion mechanism comprises a vertical spindle *L*, rotatively mounted in a frame.

Fixed upon the upper end of the spindle is a detector arm *M*, having at its inner end a yielding detector finger *N*, adapted normally to rest upon the body of the web, and upon encountering any material defect in the web, such as a prominent protuberance thereupon, or an aperture therein, to be carried along a short distance with the web, thereby rocking the spindle *L*.

Fixed upon the lower end of the spindle is a keeper *O*, for the lever *P*.

The rocking of the spindle, induced by the engagement of the detector finger, by a defective portion of the knitted web, serves to swing the keeper out of the path of the lever, and thereby to release from the control of the lever a movable member of the belt-shifting mechanism. To adapt this stop-motion device to be operated by the trip there is fixed upon the spindle an arm *R*, which normally projects into the path traversed by the trip when in a vertical position. The operator is thus able, upon the breaking of any of the feed threads, to automatically induce operation of the belt-shifting mechanism through the stop-motion mechanism commonly employed upon these machines.

DYEING, BLEACHING AND FINISHING

BLEACHING AND UNGUMMING VEGETABLE FIBERS.

After the operation of stripping or scutching, which has the result of separating the stalk or ligneous bark which surrounds the filaments of flax and hemp which are thereby brought to the condition of tow, these filaments are still surrounded by a resinous and colored substance from which they are freed by a series of lixiviating and bleaching operations.

In the processes hitherto adopted lixiviating with soda or other alkaline reagents precedes the chlorinating, that is to say the bleaching with the decoloring chlorids.

The principle of the method here described consists broadly in inverting the order of these operations and in beginning with the bleaching and in then subjecting the textile fibers to a series of operations the object of which is to further bleach them and render them more silky and of a high degree of tenuity, in keeping them ready to be subjected to the operation of combing and then to that of spinning under the best conditions.

The inventor of this method has been led to devise this process by noticing that if textile fibers are bleached before ungumming them by means of the lye, the decoloration and the bleaching are effected equally well and present the advantage of refining and bleaching the gummy or resinous substances which surround the fiber, and which may thus be collected and placed on the market without further treatment for the purposes for which these materials may be adapted.

The first operation is the bleaching. Preferably a bath having a base of decoloring chloride composed in the following manner is employed:—In 100 liters of water at the ordinary temperature of the open air, about 5 liters of a liquid having a density of 0.907 is added, this liquid being obtained by dissolving: (*a*) 10 kgs. of chloride of lime associated with carbonate of lime in 120 liters of water. (*b*) 12 kgs. of carbonate of potash dissolved in 40 liters of water at 100°. These two solutions (*a*) and (*b*) are combined and form the bath in which the textile fibers in the condition of tow, flax, hemp, ramie, etc., are steeped, leaving them there until the appearance of bleaching is noticeable. Instead of a chlorine bath, oxygenated water or ozone may be employed as decoloring agent. It has been found that the decoloring action penetrates as far as the fiber and is at the same time exerted upon the gummy or resinous portion which surrounds it.

The textile fibers thus bleached are then immersed in another receptacle containing a bath of water to which has been added: (*c*) sulphite of soda in sufficient quantity for neutralizing the action of the first bath; and 30 per cent. of the weight of the textile tow to be treated of a compound obtained in accordance with the following formula:—(*d*) 30 kgs. of a soap formed of 28 parts of margarin, 72 parts of olein combined with 4 kgs. of carbonate of soda and 45.5 kgs. of water. The temperature of this grease-removing bath so composed is that of the surrounding atmosphere. The duration of the immersion of the textiles in this bath is about 1 hour.

A fresh elimination of grease is then effected, this time with the employment of heat in a bath composed of water to which is added the soap in the proportion of 50 per cent. of the weight of the textile treated. The temperature of the bath is raised progressively to a temperature of from 90° to 95° C. It is maintained at this temperature for a period of two to four hours. After this operation the fibers are subjected to a second rinsing in clean water which is at first hot.

The succeeding operation is properly speaking the ungumming operation, the result of which is to free the fibers from their gummy or resinous covering, which, being insoluble, has not been removed by the preceding operations. The ungumming bath is composed of water to which there are added: (*f*) The soap in the proportion of 30 per cent. of the textile. (*g*) Bi-sulphite of soda, 3 per cent. of the textile. (*h*) Carbonate of soda, 2 per cent. of the textile. The temperature of the bath is the surrounding temperature and the duration of the immersion there is from two to four hours. It is followed by a third rinsing in water.

The treatment is completed by immersing the textile

fibers in a bath of water, to which there is added:—(*i*) Amylacetic ether in the proportion of 1 per cent. of the textile. The immersion takes place at the surrounding temperature and should last for two hours. The effect of the amylacetic ether is to impart to the textile fibers a luster or brilliancy, which makes them silky, and to render soluble the last insoluble portions of the resinous coating. On leaving this bath the material is rinsed in cold water at the surrounding temperature.

After these various operations, the drained textile fibers are placed to dry, in the open air if possible. When once it is dry, the textile is ready for combing and it furnishes exceedingly white fibers, which are silky and of great strength, so that it is possible to obtain the finest threads immediately in spinning, the count 200 for example and beyond, with a greater yield and an economy of time and a reduction in cost price hitherto said to have been unattainable.

FINISHING COTTON CLOTH.

A DISTINCT BRANCH IN MANUFACTURE. BLEACHING. SHEARING. CLEANING. MOTING. SINGEING. WET PROCESSES. SOURING. CHEMICING.

BY WARREN HERBERT.

Finishing cotton cloth is a distinct branch of manufacture. Although it is often carried on by the manufacturer himself, yet in large textile centers, such as Manchester, England, it is a distinct industry, carried on in special work.

The word "finishing" comprises all the preparatory and final operation employed to render the goods merchantable. To finish a fabric is to develop and make evident in the most advantageous manner, the nature of the substance of which it is composed and to give to the stuff the most favorable appearance and the qualities the most suitable for the use to which it is destined. We have already had separate articles dealing with raising and mercerizing and now propose to deal with the remaining processes which are comprised in the word finishing.

One of the most important processes is *bleaching*. Before the cloth is bleached, the pieces should be stamped with a distinctive mark by means of which they may be afterwards recognized. They are then joined together, end to end, so that the material can be put through the different processes continuously, without entanglement and with the minimum of labor. Sewing machines of a special kind, such as that shown in Fig. 1, are employed for this purpose. The thread used for stitching is generally 20/3 and should be soft twisted so as not to cut the cloth even when passing between rollers under heavy pressure. The stitch is one which will endure great tension, but which can easily be drawn out when it is required to separate the pieces. As will be seen from the illustration, the sewing machine employed is made portable so as, to be easily removed from one place to another. The quantity of pieces sewn together, or the batch, is usually two to three tons. Heavy and light cloth should be put into separate batches, as the treatment required by heavy cloth is more severe than that required by light cloth.

The first operation which the long length of cloth undergoes is shearing, cleaning or moting, the object of which is to remove the loose fiber motes, husks and ends of yarn usually found on cloth as it comes direct from the loom. The loose fibers and ends of yarn are removed by spiral cutters which revolve at a high rate of speed and which work against ledger plates in a machine as shown in Fig. 2. Fig. 3 shows a cloth cleaning machine in which rotary brushes clean the cloth which is then plaited down or rolled.

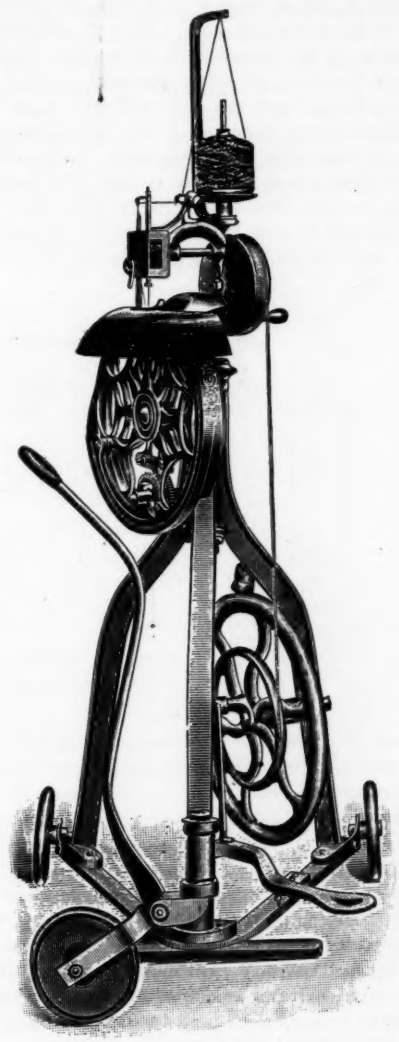


FIG. 1. SEWING MACHINE.

Singeing is the next operation, its object being to burn off outstanding fibers. This operation should be well done, for a badly singed piece is worse than a piece not singed at all. If well done it adds much to the appearance of certain finishes. There are two methods of singeing—gas singeing and hot plate singeing. The former is much the better especially for striped and figured goods, but it is not always the most economical. A gas singeing machine, is shown in Fig. 4. The burners have a continuous slot their whole length and give a solid and uniform sheet of flame from selvage to selvage; there are brass slides which go over the ends of the burners to shorten the flame when singeing narrow goods so that it may be no wider than the goods, and all waste of gas at the ends of the burners is avoided. Each flame comes in contact with the goods at two points, so that the heat from

both sides of the flame is utilized, and as the flame strikes the goods when running first in one direction and then in the opposite direction, the fibers are removed in a thorough and efficient manner.

In the hot plate system, the cloth is singed by being passed over the surface of two or more copper plates, semi-circular in shape, heated to a high temperature by a coal or oil furnace underneath. To work effectively, the whole surface of the plate should be utilized, this being accomplished by means of a traverse motion, which brings the cloth to bear momentarily on different parts of the plate surfaces. A modification of the plate system is the hot roller system under which the cloth instead of being passed over fixed plates, comes in contact with the surface of a copper or cast iron tube through which the furnace gases are allowed to pass and which revolve slowly. This system is well adapted for singeing such pile goods as velveteens, etc.

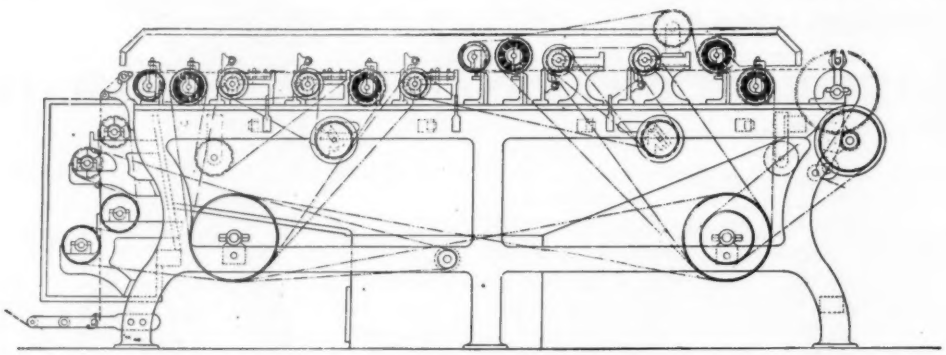


FIG. 2. SECTIONAL VIEW, SHEARING MACHINE.

The wet processes then commence with the "rotten steep" so called, because the cloth, after having been thoroughly impregnated with water by a passage through a washing machine, is plaited down and allowed to stand in a pile for from 12 to 14 hours, during which time fermentation or decomposition is set up in the starchy matter with which the warp was sized and its removal thus facilitated. The cloth passes through the roller washing machine in rope form. The machine consists of two wooden bowls of beech or sycamore, a guiding or peg rail, which should be given a traverse motion to prevent grooving of the squeezing rollers, a deep water trough and a reel or beater in front of the squeezing rollers, which, on account of its superior surface speed, prevents the cloth from sticking to and lapping round the squeezing rollers. The driving of the squeezing rollers is usually by friction clutch and pulley, and provision is made for regulating the pressure put on by the top roller. The rope of cloth passes spirally through the machine, so that it is repeatedly saturated with water, and squeezed out again before it finally leaves the machine, at a speed of from 150 to 180 yards per minute. The batch is nowadays often plaited down on a revolving platform, upon which the material is compactly built on the coiler can principle.

Besides the washing machine already mentioned, the equipment of a bleach house capable of turning out 50 to 60 tons of cloth per week, consists of six boiling kiers of about 3¼ tons capacity each, and say, eight stone cisterns, each of about 400 cubic feet capacity with wells and pumps.

Working at the rate of 10 to 12 hours per day, the labor required for the above plant would be about 18 boys, two young men and five journeymen.

The process of bleaching proper consists in alternate boiling, washing, chemicing and scouring. For instance—calicoes and nainsook may be first steeped in hot water, then washed and given a first lye boil for 10 hours, in a solution of soda at 3° Tw. with olein soap in water all at 225° F. The boil is followed by another wash and then a second lye boil given, the same as the first and again followed by a passage through a washing machine. The fabric is next chemiced in a stone cistern and then again lye boiled. Another chemic steep for 5 or 6 hours follows, after which the fabric is again washed and wrung before being soured and again washed and squeezed. Another lye boil follows, the lye being prepared with carbonate of soda to 3° Tw. Marseilles or olein soap being added. The duration of this boil is about 6 hours at 212° F. The cloth is then washed in the kier and again chemiced

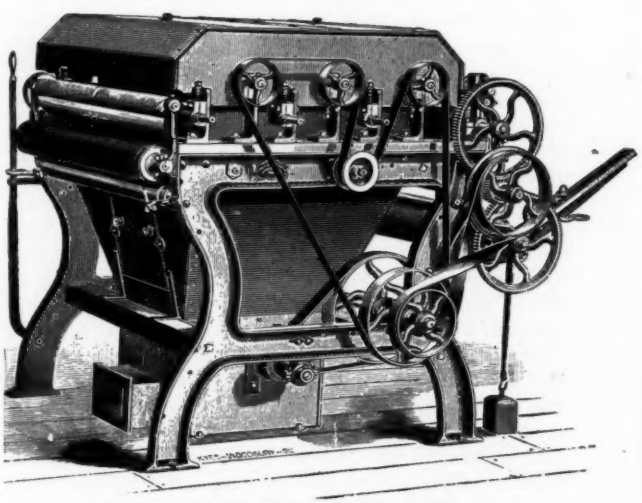


FIG. 3. CLOTH CLEANING MACHINE.

and soured in a weak solution of sulphuric acid as before. Another lye boil chemic and thorough wash finishes the process.

A rather different process is employed for heavier goods, beginning with a lime boil for 10 hours, the quantity of lime used being about 10 per cent. on the weight of the fabric. This boil at 212° F. is followed by a sour steep for 6 hours in dilute hydrochloric acid at 3° Tw. The cloth is then well washed and boiled for 10 hours in soda

lye at 4½° Tw. given by 10 per cent. of salt on the weight of the cloth with the addition of rosin soap. After this boil at 225° the cloth is washed in the kier and then a second and similar lye boil given followed by another passage through the washing machine. The cloth is then steeped in the chemicing cistern for 3 hours and again washed before being soured for 6 hours in a weak solution of hydrochloric and sulphuric acids. Another 8 hour lye boil follows at 225° F. in a lye of 2° Tw. strength prepared with carbonate of soda in the proportion of 5 per cent. of carbonate of soda and 1 per cent. of Marseilles soap on the weight of the fabric. The fabric is again washed and then given a second chemic same as the first, again washed and then soured as before, being finally very thoroughly washed.

THE COST OF STARTING UP A NEW TEXTILE MILL.

A most intangible but a very real expense incident to the cost of a new textile mill and equipment is that concerned with starting up. Only after a period of several months can the entire plant be brought into a condition approximating maximum efficiency. There are wastes on every hand, not only those resulting from absolute errors or slight inaccuracies in the setting but a host of minor losses—in material, in power and in human effort that in the aggregate mount up to a considerable sum. In a recent report F. W. Dean, mill engineer and architect, Boston, Mass., makes an allowance of no less than $10,000 for the single item of "starting up" aside from that of erecting in the case of a mill equipment costing about $200,000—an amount equivalent to five per cent. of the total cost. During the tuning up process frictional losses in shafting, belting and machinery are excessive, the operatives although generally experienced have to accommodate themselves to new conditions, there are recurring breaks and stops, with a resulting excess of poor work. All these combine to increase the unit cost of production to an extent that should not be overlooked. It has been estimated that in a textile mill fully one-half of the operating expense for three months should be charged as the cost of starting up.

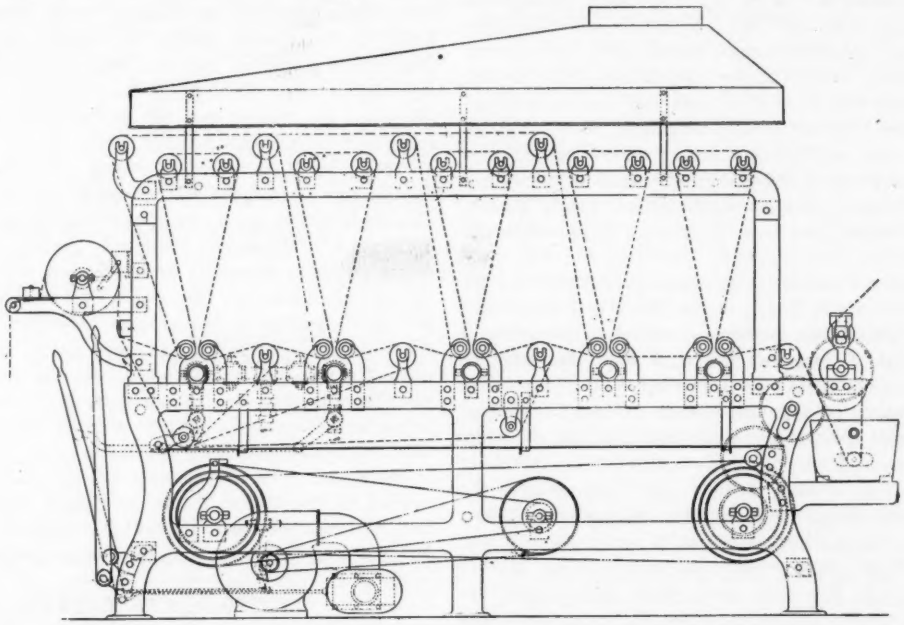


FIG. 4. SECTIONAL VIEW, 5 BURNER GAS SINGEING MACHINE.

For convenience of working, the washing machines should be placed between the sour and the chemic cisterns. *Liming* consists in running the cloth through milk and lime or calcium hydrate in the liming machine and then into the kier. *Bowking or boiling* with lime is done in kiers which should be regularly lime washed to avoid iron stains. *Bleaching kiers* are constructed in a variety of forms. In a circulating kier, the circulation is maintained by means of a special injector which produces a rapid circulation of the boiling liquor with a small steam consumption. The circulating kier is used in sizes up to 7 feet diameter and arranged to work at either high or low pressure.

The low pressure kier is specially adapted for cloth when it is required to bleach at a low temperature, and when time is not a consideration. The circulation of liquor is produced by means of a puffer pipe and a steam jet or by an injector.

Souring is often done by passing the cloth through a washing machine containing an acid solution.

The chemic is a solution of bleaching powder at 1½ to 2½° Tw., which is run into the cistern as the men in rubber boots tramp down the cloth.

The efficiency of any steam heating system depends on the amount of steam condensed or relieved of its heat per square foot of surface exposed.

It frequently happens that materials holding variable amounts of sizing compounds, perhaps only sufficient to favor weaving, but, as often as not, more than is good for the ultimate production of the best results either in the course of bleaching, printing, or dyeing, have to undergo some preliminary form of treatment with the object of removing them.

MARKET REVIEWS.

COTTON MARKET.

BY H. & B. BEER, NEW ORLEANS.

The market maintains a steady undertone despite the fact that the movement to market tends to confirm large crop ideas, probably about 13,500,000 bales. The sequel to this is that spinners find this crop unusually good in quality, and being relatively cheap are turning it into cloth, especially in America, on a record breaking scale. Thus far this season American mills have taken considerably more than ever before, and it is expected that the total takings for the season will be of record breaking proportions, probably about 5,200,000 bales compared with 4,090,000 last season and 4,965,000 season before last. It is probable that Europe, with Canada and Mexico, will require about as much cotton as they took last season, perhaps more, or about 8,000,000 bales compared with 7,857,000 bales last season and 8,095,000 season before last. Therefore, there is every probability of the mills of the world taking nearly all, if not the whole of last year's growth, large as it was and as poor as trade is supposed to be in England.

With such a showing in the way of absorption by the spindles of the world, during normal times in America and poor trade abroad, the question arises as to what would the mills need of American cotton if conditions were to become normal the world over, which is not at all impossible of materilization in the near future. There is nothing on the political horizon to disturb trade; on the contrary, everything is in favor of business expanding, especially in textiles. The Balkan troubles have been settled, the Franco-German dispute over Morocco has been satisfactorily adjusted, and California has acted in accord with advice from Washington, which removed a possible rupture with Japan. It has been three years since China has been in the market for cotton goods, so to speak, having purchased only $3,390,000 worth of goods last season, the year before last only $5,933,000, whereas in season of 1905-6 they bought goods to the extent of $27,889,000 in the United States.

Since the opening of the new years quite a business has been put through at New York for account of China, and it is probable that more will be doing on account of the Flowery Kingdom for the balance of this season than was done during the past three years. China has also appeared as a buyer in a moderate way in Manchester, of late, and news from India is to the effect that large food crops have been grown in that country, and that it is probable that a large business will be done in cotton goods with England.

Under the circumstances, there is every indication that trade in textiles in Europe, particularly in England, will gradually improve; and to meet such possibilities, a great deal of attention is being paid to prospects for the next American crop.

Weather conditions, permitting of the best results, have not been favorable thus far. There has been an insufficient amount of rain in the South this year, particularly in Texas, more so in the western portion of that important State, and while there is ample time to secure the needed moisture, it is feared that the rains will be delayed until planting begins, which, if realized, would serve to delay preparations for the new crop. Delays are usually dangerous, especially with the growing of cotton, as the weevils have to be contended with, as does the possibility of an early frost.

As to the weevil situation, the outlook in the lower Mississippi Valley, in Louisiana and Mississippi, is not at all encouraging. Reports are to the effect that merchants are refusing to advance liberally to enable farmers to grow cotton. Aside from this, the damage done by the weevil last year in Louisiana was so great that there is every probability of the acreage being reduced considerably in this State, perhaps in sections of Mississippi also. As a matter of fact the Southern farmer has been schooled in the necessity of diversification, having been instructed by officials and the press to grow more food crops and less cotton.

While we do not look for any material decrease in the acreage east of the Mississippi River, it is not probable there will be an increase, but west of the Mississippi, in Texas and Oklahoma, there will probably be some increase owing to the influx of immigrants and the opening up of new land. On the whole, however, there will be but little increase in the acreage of cotton this year, if there be any increase at all, and as so much depends upon the elements, more so than on the acreage, in the making of a large crop, a moderate, perhaps a short crop is not at all impossible, whilst a large crop would probably find a market at good prices.

It is for these reasons that we entertain a favorable opinion of the distant future, as regards cotton, believing that purchases of new crop deliveries, October and December, will eventually prove to have been profitable.

COTTON YARN MARKET.

There is no material change in the quotations given last month. Prices are practically the same. Conditions are in no wise improved. The market is weaker than at any time since the advance last October. A great many mills are running out of work, and within the next two or three weeks must secure work or shut down. At the prices which are being quoted, the mills claim they can not get out whole not to say anything about making a profit. The entire range seems to be weaker not only on Southern, but on Eastern yarns.

There has appeared in some of the New York trade papers, during the past few weeks, advices that trade was better in Boston and better values were being obtained in Charlotte, but careful investigations show that the statements were not warranted by facts, and rather the trade in Boston and vicinity has been just as dull as in any other part of the country. It was stated in a despatch from Charlotte that 20 2-ply warps sold at 19 cents, and that mills were anxious and willing to book orders at 18 cents. This statement is not confirmed.

It looks as if there were going to be some improvement in the demand, but the prospect for higher values for yarn does not look promising, and until the stocks on hand are reduced, and there is an increased demand by consumers to take care of the products of the spindles,

there does not seem to be any likelihood of getting remunerative prices, letting alone advances. Already some of the mills have been obliged to accumulate goods.

We are now coming to the season of the year when we should have a good trade if we are going to have any at all. There is, of course, a distinct improvement in business, and a great many of the mills are running full, and some are pressed in departments, but as a rule the consuming trade is drawing no more than 80 per cent. of the quantity consumed in 1907. There is going to be a slow and steady improvement in cotton business, same as in the steel and other large industries. One branch of the textile trade which has not been consuming any yarns to speak of, is the woolen industry, and whether or not this will continue in the same condition, is something which can not be foreseen. There, of course, must be a large amount of these yarns used in the future as there has been in the past. Manufacturers as a rule feel hopeful, but are unwilling to anticipate their wants until they cover on their own goods.

SOUTHERN SINGLE SKEINS.

4s to 8s	15	@15½	22s	18	
10s to 12s	15½	@16	26s	18	@19
14s to 16s	16½	@17	30s	20	@21
20s	17½	@18			

SOUTHERN TWO-PLY SKEINS.

4s to 8s	15	@15	30s	20	@20¼
10s to 12s	15½	@16	36s	23	@24
14s	16		40s	24	@25
16s	16½		50s	30	@31
20s	18		60s	29	@30
24s	18½		8-ply 8s upholstery	16	
26s	19		4-ply 9s upholstery	16	

SOUTHERN SINGLE WARPS.

8s to 10s	15½		22s	17½	
12s	16		26s	19	
14s	16	@16½	30s	20½	
16s	17		40s	25	
20s	17½				

SOUTHERN TWO-PLY WARPS, ETC.

8s to 10s	15½	@16	26s	19½	
12s to 14s	16½		30s	20½	
16s	17½		40s	25	
20s	18		50s	31	
24s	19				

SOUTHERN FRAME PEELER CONES.

8s	15		20s	17½	@17¾
10s	16		22s	18	
11s	16¼		24s	18½	
12s	16½	@16¾	26s	19	
14s	17		30s	20¼	
16s	17¼		40s	21	@21½
18s	17½				

THE KNIT GOODS MARKET.

The developments of the trade, as observed by those on the road, indicate a low stock of goods in the hands of retailers, and the impression is quite general that a strong demand will soon present itself, enough to give manufacturers all the orders that they can conveniently handle. It seems to be more a question of confidence than anything else at the present time.

Notwithstanding everyone believes in an underlying strength of the market, business during the last month has been of much dullness, and very little new business has been placed for any of the spring or fall lines. A good many duplicate orders are anticipated owing to the slowness with which original orders are being placed. Shrewd buyers are realizing the fact that the present time is one for placing orders and are acting upon their conviction with the undoubted result that they will be the ones who will reap the benefit of trade when it becomes more active.

Some manufacturers are reported as having more orders than they can fill, and especially does this apply to those making high grade hosiery in contrast to those who are confining themselves to the production of the cheaper grade. There is a great demand for mercerized goods and large lots of these fabrics have been sold of late.

Manufacturers in the Mohawk Valley report that local conditions are strong and flourishing with an abundance of orders, though continued evidence that buyers are acting with conservatism.

It is stated that the demand for sweaters, sweater coats and underwear continues good. The Capron Knitting Co., Utica, N. Y., is said to be sold up for its sweater coat production until next winter. An advance in price on knit goods is anticipated.

The tariff question is uppermost in the minds of manufacturers, and much concern is expressed concerning what will be done by congress relative to the rates of duty and classification on knit goods imports.

William Waring, chairman of the tariff committee of the National Association of Hosiery and Underwear Manufacturers, who has a branch house in Saxony in the center of the woolen industry, speaking on the dangers of tariff revision downward, is quoted as follows:

"During the last five years the protective system under which we have been living has been a favorite topic of the theorist. From all sides the people have been assailed with their fallacies and vaporings and perversion of the real facts until the time has arrived when there should be a final 'showdown.'

"Were it not for our protective tariff the conditions during the last fifteen months in this country would have been much more unfavorable than they have been, as bad and as difficult to solve as they were. The company would have been flooded with low price textiles, not only completely prostrating but effectively killing our industries.

"The average man has no serious conception of the enormous difference in the cost of manufacturing abroad and in this country, a difference due entirely to wages.

"It is a self-evident proposition what the result would be if the American laborer engaged in the knit goods craft should be reduced to this basis. It is a favorite topic of the theorist and tariff reformer to talk of the standard of living abroad and in this country. He forgets that the reason why immigrants to the extent of nearly one million a year come to this country to make their homes with us is because they desire to improve the standard of living. It is true that American work people live better, enjoy more of the luxuries and comforts of life than any other class of workmen in the world."

TAPPET POWER LOOM.

Dr. Edmund Cartwright, born at Marnham, Notts., in 1743, the inventor of the power loom, in 1785, after his first loom had proved unsuccessful, observed: "Availing myself of what I then saw"—namely, hand-loom weavers at work—"I made a loom in general principles nearly as they are now used."

This he accomplished by mechanical substitutes for the weavers' hands and feet. Cartwright's loom was of the tappet kind, that is, "eccentrics," or "cams" operating on treadles for actuating the heald shafts, lifting and depressing the warp threads.

The modern tappet loom is the result of subsequent improvements, and has been used for some years in the production of simple weave fabrics.

NEW ENGLAND MILL SHARES.

FALL RIVER MILL STOCKS.

By H. M. Haffards & Co., Fall River, Mass.

	Bid	Ask		Bid	Ask
American Linen Co	123½	125	Merchants' Mfg. Co	117½	120
Arkwright Mills	106	107½	Mechanics' Mills	115	117½
Barnard Mfg Co	116	117½	Narragansett Mills		142
Bourne Mills	97½	100	O born Mills	114	116
Cornell Mills	182½	...	Parker Mills		100
Chace Mill	132½	137½	R. Borden Mfg. Co.	180	185
Davol Mills	102	105	Seaconnet Mills		97
Davis Mills	130	132½	Shove Mills	96	97½
Flint Mills	106	108	Stafford Mills	116	118½
Granite Mills	150	155	Stevens Mfg Co	90	.....
Hargraves Mills	104	106	Tecumseh Mills		151½
King Philip Mills	174	180			

NEW BEDFORD QUOTATIONS.

By Sanford & Kelly, New Bedford, Mass.

	Bid	Ask		Bid	Ask
Acushnet Mills	320	.....	Nonquitt Spinning	123	.....
Bristol Mfg. Co		150	Page Mfg. Co	119	.....
Butler Mill	146½	.....	Potomska Mills	125	.....
City Mfg. Co	250	.....	Pierce Mfg. Co	350	.....
Dartmouth Mfg. Co	225	.....	Soule Mill	150	.....
Gosnold Mills pf	106	.....	Taber Mill	94	.....
Grinnell Mfg. Co.	210	...	Wamsutta Mills	180	.....
Kilburn Mill		165	Whitman Mills	142	.....
Manomet Mills	134	.....			

By Philip M. Tucker, 35 Congress St., Boston.

	Latest	Previous		Latest	Previous
Appleton	152½	148	Great Falls	194¼	194
Amoskeag	300-304	301	Hill	65	61½-65½
Androscoggin	155	153½	Jackson	997½	960
Arlington	144½	144½	Lancaster	138⅜	138
Atlantic	76¼	74½	Lawrence	155	145¼
Barnes	220¾	215	Lockwood	101¼	102
Boston Mfg. Co	46½	46½	Lyman	110¼	105¼
Boston Duck	1325	1275	Massachusets	181¾-182	180-180⅝
Cabot Mfg. Co	85½	76	Monadnock Mills	1017¼	950
Chicopee	100½	95	Nashua	542½	527
Continental	78	69⅛	Naumkeag	124-125	121¼-125
Dwight	1005	1005	N. E. Cot. Yn. com	75	72
Edwards	116	115¼	Pepperell	295½	295
Everett	130	127½	Trem't & Suffolk	112	112
Franklin	106⅛	105¼			

SOUTHERN COTTON MILL STOCKS.

Quotations by F. C. Abbott & Co.,

Charlotte, N. C.

	Bid	Asked			
Aiken Mfg. Co	75	85	Lanett	97	121
American Spinning		140	Langley Mfg. Co	90	96
Arkwright Mills		...	Linden, N. C	100	105
Arlington		166	Limestone	140	...
Avondale	115	125	Loray, pref 1901	90	92½
Augusta, Ga	60	...	Lowell		...
Bonnie	121	...	Mooresville, N. C	110	...
Bloomfield		118	Lumberton		226
Brandon Cot. Mills	148	...	Mills Mfg. Co		106
Brookside		105	Modena Mills		125
Capitol City, pref		82½	Mollohon		105
Chadwick-Hoskins Co		100	Monarch, S. C		102
Clara		121	Newberry		146
Clover		...	Nakomis N. C		156
Clinton		...	Olympia, 1st	71	...
Clifton, pref		103	Ozark	125	150
Cliffside	155		Patterson	125	135
Chiquola Cot. Mills	128	131	Piedmont Mfg. Co		176
Cherokee Mfg. Co		...	Pelzer		...
Converse		117	Pell City, com		95
Dallas Mfg. Co., Ala	95		Pell City, pref	100	...
Dillon	65	68	Saxon		126
Efird, N. C	125	...	Sibley, Ga	60	...
Elmira, pref	96	...	Social Circle	99	...
Eagle & Phoenix		121	Spartan Mills	125	...
Easley	150	160	Springstein		...
Edenton, N. C		...	Statesville Cot. Mill	107	...
Exposition		240	Trenton, N. C		...
Fairfield	75	...	Tryon, N. C		143
Florence, N. C		131	Tuscarora	115	...
Gaffney Mfg. Co	70	75	Tucapau, S. C	200	...
Gaston		100	Toxaway		92
Gainesville	49	...	Union Buffalo, 1st pref	55	66
Gibson	95	...	Union Buffalo, 2d pref	17	21
Graniteville, S. C	160	168½	Victor Mills, S. C		125
Gray Mfg Co	121	126	Warren Mfg. Co, pref	103	...
Grendel	119	...	Washington Mills	30	31
Greenwood		86	Washington Mills pref	108¼	...
Highland Park		170	Watts	90	98
Hartsville pref	100	...	Wareshoals		...
Hartsville		...	Whitney		125
Inman Mills S. C		107	Wiseassett	125	
Kesler	135	...	Woodside	102	105
Jno. P. King Mfg. Co	91½	...	Woodruff		124
Lanaster, com	123	...	Williamston		108

The Textile Mill Situation in New England and the South.

NEW ENGLAND MILL SITUATION.

(*Special Correspondence.*)

The market for cotton fabrics in New England continues to broaden with an advancing tendency in prices. Commission houses are well sold up, particularly on fine and colored goods, and report a dearth of spot goods for immediate delivery. Ginghams are sold six months ahead and prices have been strengthened for all grades of Northern ticks and ginghams. Lawns are sold ahead to July and prices have been advanced, while print goods are steady with a firm undertone. The yarn market has braced up slightly and cotton machinery men report an increase of orders for immediate delivery.

A very bright spot in the cotton goods situation is the demand for drills and sheetings for export to China and India. So far this year there have been about 9,000 bales of Laconia, Pepperell and miscellaneous standard drills exported through one Boston commission house, which compares with 233 bales during January and February of last year. New York export houses report a splendid demand for wide sheetings at the market prices, but spot deliveries are required. Sheetings will be advanced before March 1st if the present improvement holds and everyone feels confident that it will. The South American market is quiet.

Fine goods are stronger and in better request than at any time for 14 months. Prices have been advanced fractionally on all lines and orders are being booked quite freely for May and June delivery. Two of the larger New Bedford mills are sold up to October 15th and are turning down orders every day. Wellington, Sears & Co. have advanced their lawns which are sold four months ahead. Bliss, Fabyan & Co., have advanced tickings and other colored goods while Lawrence & Co., have withdrawn prices on Pacific and Cocheco fabrics pending an advance.

Coarse yarn fabrics are not so active as a month ago, because orders are being taken for three months delivery at advancing prices only, which does not appeal to buyers. Manufacturers are not inclined to take orders for June and July delivery at prevailing prices. Fall River plants are operating at full time with about 92 per cent of their machinery running. Converters are buying near-by deliveries, but appear unwilling to bid beyond ⅛ to ¼ cent for six to eight month deliveries.

The yarn market is decidedly uninteresting for both the spinner and weaver. There is a deadlock between the two factors on certain counts and unless concessions are made spindles will be forced into idleness. There have been concessions on certain counts, 30s and 40s two-ply for instance, and heavy sales resulted. Such counts as 20s two-ply skeins have sold as low as 18 cents while 20 cents is the general market quotation. Knitting yarns are quiet because of the general feeling of hesitation among knitters, while on the other hand carpet yarns are being sold quite freely at prevailing quotations. The yarn market as a whole is decidedly spasmodic, and indications point toward a continuance of this condition for some few weeks to come.

Manufacturers of textile machinery are feeling the impulse of better times in the cotton industry, both as to

demand and prices. Reports are very favorable from the larger concerns making weaving and spinning machinery and makers of supplies for textile mills are increasing their production steadily. Loom builders are very busy with orders that have been placed for some months but were ordered for early spring delivery. Draper Co. are very much encouraged with the outlook and are confident that after the tariff issues are settled there will be a radical improvement in the cotton industry. At the semi-annual meeting of the National Association of Cotton Manufacturers held in Boston, last April, Gov. Eben D. Draper exactly forecasted the economic developments of the cotton industry through the year 1908, and said that while there would be an improvement in the early months of 1909 he did not anticipate any marked improvement in the industry until after the tariff schedules were settled by Congress. Gov. Draper is of the same opinion to-day.

Cotton mill stocks continue to be very popular among a class of investors that prefer tax exempt stocks. Stocks of cotton mills that are incorporated under the Massachusetts laws are not taxable in this State, in fact, they are also tax exempt in all other New England States. Issues that are offered at the weekly auctions are eagerly snapped up by discriminating investors who believe dividends will be increased before many months, and prices are soaring upwards. Naumkeag Steam Cotton Mills sold up to $120 per share, or an advance of $20, in three weeks. Bates made a new high record of $250 as compared with $190 one year ago. Fall River issues are in great demand and are advancing steadily. This is also the case with New Bedford stocks which are getting very scarce and many issues can not be purchased at a bid of ten or fifteen dollars above the last sale. The cotton mill share market looks top-heavy. Prices have advanced too rapidly to hold and a reaction will soon be due.

SOUTHERN TEXTILE MILL NOTES.

(*Special Correspondence.*)

The fact that there is no let-up in new mill construction work in the South, in the face of unfavorable markets, demonstrates forcibly the confidence of mill men and capitalists in the future of the textile business. Among Southern mill men there seems to be an assurance that the present apathy characterizing dealings in yarns will surely be followed by active operations on a sound and profitable basis, and many new mills are being organized all over this section, and many others already established are engaged in improving their facilities for turning out more product. The revival in export business is hailed with delight. For two years past there has been very little exporting done, and it is believed the recent revival along this line is of a substantial nature, and will continue to gain strength. During the past few weeks many large shipments have been made abroad by Southern mills, and export men are very optimistic.

The past month has witnessed an almost record breaking number of new mills chartered.

Contract has just been placed with the Mason Machine Works, Taunton, Mass., for the cards, spinning and drawing of the 25,000 spindle addition to the Woodside Cotton Mills, Greenville, S. C.

Seven thousand additional spindles will be installed by the Perkins Hosiery Mill, Columbus, Ga., at an early date, according to a report just received here.

A report from Edgefield, S. C., is to the effect that the Edgefield Manufacturing Co., will sell its plant at an early date and that the new owners will put it in running order.

A new mill for Smithfield, N. C., is the Ivanhoe Mfg. Co., with an authorized capital of $300,000, for the manufacture of warps, hosiery, electrical or underwear yarns, etc. W. M. Sanders and others are the incorporators.

Night work has been suspended by the Gaston Manufacturing Company, Cherryville, N. C., whether temporarily or for an indefinite time is not stated. There seems to be a tendency to eliminate night work in many parts of the South. It is said that only about 50 of the 360 mills in North Carolina now run at night.

A charity hospital for the benefit of employees will be erected at Duke, N. C. by the Erwin Cotton Mills Company.

The handsome new Y. M. C. A. built by the Cannons for the use of their employees at Kannapolis, N. C., is completed, and is becoming more popular as a resort every day.

W. A. Erwin has returned from Providence, R. I. where he went to purchase machinery for the new Erwin Cotton Mill. It is not known positively whether the new mill will be located at Duke or Durham, N. C.

COMPULSORY EDUCATION FOR CHILDREN.

FAVORED BY COTTON MANUFACTURERS OF SOUTH CAROLINA.

Ellison A. Smyth, president of the Cotton Manufacturers' Association of South Carolina, has sent the following letter to the press:

"That the action of this association, taken at their recent meeting in Charleston, in reference to a compulsory school law, may be clearly understood, I have been requested to publish in full the resolutions adopted, which are as follows:

First—That the association renews its recommendation to the legislature, that there be passed a general compulsory education law, requiring the compulsory education of children under 14 years of age.

Second—That provided there be passed such compulsory education law, this association feels that there is no objection to advancing, under proper limitations and restrictions, the age limit of children working in textile mills and other industries to an age to comply with the general compulsory education law as passed.

Third—That this association also renews its strong and urgent recommendation to the legislature that a law be passed in this State requiring registration of births and marriage licenses.

The cotton manufacturers believe that the best way to regulate child labor would be by a general compulsory school law, and they desire to emphasize the fact that they approve of a general compulsory school law, and have urged the passage of such a law for ten years, but they oppose any compulsory school law limited only to the residents of mill villages."

The fact is well known that the decolorizing properties of a bleaching liquor depend upon its temperature, for the practical bleacher knows well that liquors are more energetic in their action in summer time than in winter.

The fresh air for use in a mill heating system is usually supplied from out of doors, and in heating weather is always cool enough to absorb heat from almost any source of even moderate temperature.

NEW MACHINERY AND TRADE NOTES

CLEANING TEXTILE MACHINERY BY COMPRESSED AIR.

The use of compressed air for cleaning all kinds of machinery is now conceded to be so efficient and economical that industrial establishments and manufactories of every class are considered incomplete without a suitable air compressor plant.

In textile mills, especially, where the lint and dust accumulating on the machines and walls form an extremely inflammable substance, the necessity of thoroughly removing such material is of prime importance. Up to date, no more effectual means of accomplishing this has been devised than by the use of a jet of compressed air. Moreover, by this method of cleaning the necessity of shutting down the various machines for cleaning is in large part avoided.

APPLICATION OF COMPRESSED AIR FOR CLEANING SPINNING MACHINES.

In the illustration is shown a spinning frame undergoing a cleaning by this method. In the New England factory in which this photograph was taken the spinning frames were cleaned by two boys working together, one on each side of the frame; thereby the lint removed from one side did not blow over to the other side. Each frame had 256 spindles; it took the boys seven minutes to clean one frame, and they cleaned seven frames in an hour, the remaining time being used for the shifting of the hose.

The piping as arranged in this factory is very convenient and economical. The suction of the compressors is piped to the outside atmosphere where cool, dry air is obtainable. This is a wise provision, as the air in a textile mill is just the opposite of this, being warm, moist and full of lint and dirt. The main supply pipe crosses outdoors from the machine shop, where the compressors are located, to the factory. There is a distance of about 20 feet between the buildings. In this space is installed a cooling coil, to condense all moisture possible. A trap for the condensed moisture is placed in the factory close to the wall through which the air main enters. This results in the removing of all excess moisture from the air, which is very necessary, as any excess moisture on the yarn is liable to produce serious injury.

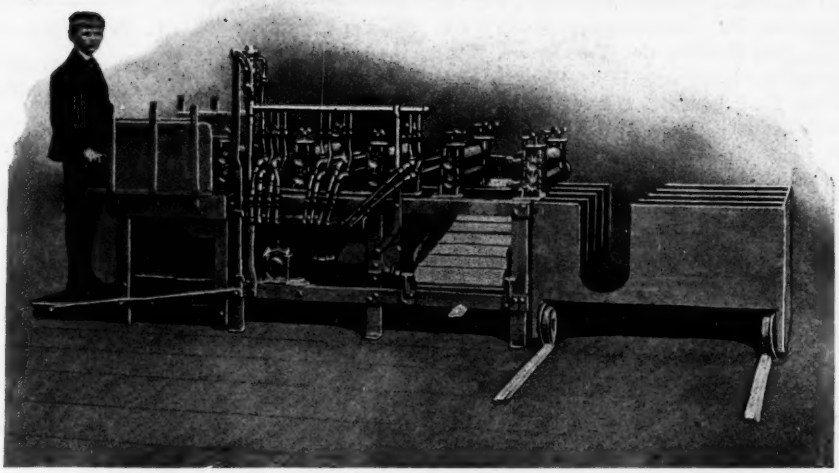
The pipe line through the mill is two inches reduced to one inch or ¾ inch at each branch leading to a hose connection. There are five stories. The first and second floors are supplied from one line of piping running along the ceiling of the first floor and branching downward to the first floor connections and upward through the ceiling and floor to the second floor connections. The fourth and fifth floors are supplied in the same manner by a pipe line along the ceiling of the fourth floor. The hose connections are placed fifty feet apart, and fifty-foot lengths of hose are used.

The compressor plant was manufactured by the Westinghouse Air Brake Company. The compressors are the same in nearly all details as those furnished with their well known air brake equipments, in which severe service their performance has been characterized by reliability and efficiency. This plant consists of two belt-driven compressors with automatic governor, storage tank and accessories. They are particularly well adapted to the class of work above described, being simple, compact, easily installed and requiring little attention. The wearing parts are all enclosed and protected, but quickly accessible. By the use of the governor, the operation of the compressors may be made entirely automatic, keeping the air pressure within certain prescribed limits.

There has been some discussion concerning the proper pressure for the air jet. Experiments, however, seem to show that, for textile mills, about 40 pounds per square inch gives the most satisfactory results. Any considerable excess above this is likely to break the yarn, or disseminate the dirt in small particles, which being caught in the fabric produce soiled spots. Moreover, a high pressure requires more free air per minute and a corresponding increase in the size of the compressor plant, without doing any more work. On the other hand, lower pressure naturally decreases the efficiency of the jet. With 25 pounds of air it will take 100 per cent. more air to clean a machine than with 40 pounds.

AUTOMATIC SINGEING MACHINES.

The automatic singeing machine which we herewith illustrate for the singeing of hosiery is the invention of George W. Stevenson and is built by him at 854 Penn st., Reading, Pa. This machine has no dangerous leather belts. It is provided with an endless sprocket chain which never slips, thus saving time and expense. An important feature is the attachment of a counting device which enables the operator to see at a glance just how many boards have passed through the machine, and is especially convenient for the job trade. The pipe connections are all solid, and no rubber hose is used. By the use of an air inlet device it is impossible for dust and lint to get into the fan. There are five sets of rolls, all air cooled, which is very necessary for turning out high class work; the upper set of rolls easily adjusting themselves to any thickness of boards. Because of an improved table one



AUTOMATIC SINGEING MACHINE FOR HOSIERY.

can feed boards by the top instead of the toe. The boards, after passing through the rolls and a stripper, are deposited in pockets, of which there are four, as shown in the illustration. This method of feeding saves the toe end of the boards. The burning of the hose is altogether out of the question with this machine. A convenience about the machine for saving labor is that, after the hose is stripped by the stripper it drops into a conveyor, is carried away from the machine, and deposited in trucks, baskets, or some other receptacle.

The machine is so constructed that when the operator steps off the platform (see illustration) the flow of gas is cut off and nothing remains burning but the small pilot lights, of which there are three and which are controlled by a stop-cock the same as an ordinary gas burner. Each set of burners is fed separately with air and gas. The mixture of air and gas is an important feature, and it is very necessary to have plenty of the former. This machine has an 8-pound pressure-fan together with an air cylinder with area sufficient for all makes of hose.

With the stripper that is attached to this machine there is no chance of choking, and every board goes through with the hose retaining its proper shape, especially in the top. There are two sets of brushes so connected that they run in the same direction as the rolls. The first set raises the nap, the second removes the carbon and the spark. All brushes are made fire-proof.

THE ROSSMASSLER-BONINE ELECTRIC CO., Philadelphia. We are in receipt of several bulletins issued by this company relating to its small direct current motors which are said to be of excellent design, high efficiency, and noiseless in operation.

A. D. SALKELD & BROTHER, N. Y. This firm has moved its place of business from 66-72 Leonard Street to 366 Broadway, corner Franklin street, rooms 811, 812, and 813. Its business will be conducted as heretofore, through Frederick Vietor & Achelis.

SCHUCHARDT & SCHUTTE, manufacturers, exporters and importers of machinery, small tools, hardware and steel with headquarters at Berlin, Germany, have removed their New York office and warerooms from 136 Liberty street to 90 West street, West Street Building.

BICALKY FAN COMPANY, Buffalo, N. Y. This company has issued an attractive catalogue relating to its patent fans for heating, ventilating and drying.

LIBERTY MANUFACTURING COMPANY, Pittsburg, Pa. The arrangement that this company has had with the Advance Packing & Supply Company to handle its business has been terminated and it has opened an office at 1201 Manhattan Building, Chicago, where it will have its own representatives, W. M. Burns and G. M. Porter.

AMERICAN MOISTENING COMPANY, 79 Milk street, Boston, Mass. Repeat orders for new humidifying apparatus have been placed with this company by The Arlington Mills, Lawrence, Mass; Keith Paper Company, Turner Falls, Mass; Dundee Textile Company, Passaic, N. J.; Highland Worsted Mills, Camden, N. J.; Lonsdale Company, Lonsdale, R. I.; Jos. Bancroft & Sons Company, Wilmington, Del.; Manville Company, Woonsocket, R. I.; Parkhill Manufacturing Company, Fitchburg, Mass., and the R. & H. Simon Company, Easton, Pa.

GEO. MAYO MACHINE CO., Laconia, N. H. Because of the large amount of business now booked by this company for its new and improved 1909 model full automatic knitter, it is now increasing its large and up-to-date plant by the addition of a quantity of new and improved machine tools in order to meet the demands of its customers for prompt deliveries. This company claims to have the largest output of machines of any manufacturer of full automatic seamless hosiery machinery, and its capacity will be materially increased by the addition of the above tools. Its new 1909 model has a very important feature said to be not found in other machines, namely, a self cleaning sinker head which prevents the sinkers from clogging up with dirt and lint, and assures that the fabric will always be of even tension and uniform appearance, and that less seconds will be produced; also saves loss of production through stopping of the machine to be cleaned every two or three weeks. Among the orders recently received are those from Alden Mills, New Orleans, La.; Antietam Knitting Co., Hagerstown, Md.; Durham Hosiery Mills, Durham and High Point, N. C.; Better Sox Knitting Co., Ft. Atkinson, Wis.; Union Mfg. Co.,

Union Point, Ga.; Madeira & Wanner, Fleetwood, Pa.; D. F. Kelchner, Fleetwood, Pa.; Chambersburg Hosiery Co., Chambersburg, Pa., Zulu Knitting Co., Two Rivers, Wis.; Kalamazoo Knitting Co., Milwaukee, Wis.; Wellknit Hosiery Co., Harrisburg, Pa.; Industrial Hosiery Mills, Mohnton, Pa.; Rothsville Knitting Mills, Rothsville, Pa.; Wiscassett Mills Co., Albemarle, N. C.; Chicago Guarantee Hosiery Co., Chicago, Ill.; Robesonia Knitting Mills, Robesonia, Pa.; Allensville Hosiery Mills, Allensville, Pa.; Davies Hosiery Co., Reading, Pa.; Paramount Knitting Co., Chicago, Ill.; Phoenix Knitting Works. Milwaukee, Wis.; Pitman Mfg. Co., Laconia, N. H.; G. H. Tilton & Son, Laconia, N. H.; A. R. Kreider & Bros., Annville, Pa., and High Point Hosiery Mills, High Point, N. C.

STEVENSON BROS., Reading, Pa., have built a new hosiery mill which was ready for operation March 1st. It is equipped with 36 Boss Knitters to start with, but more machines will be added later.

AMERICAN DRYING MACHINERY COMPANY, 19th & Westmoreland Street, Philadelphia, Pa. We have received a small pamphlet from this company relating to its "20th Century" steel dryers for drying wool, cotton, stock, yarn, stockings, underwear, Turkish towels, and for carbonizing. These dryers are endorsed by the board of underwriters and do not increase the rate of insurance upon the property in which they are placed.

THE EUREKA FIRE HOSE MANUFACTURING COMPANY, Jersey City. New Jersey, is erecting a new store house to its plant. The construction of the building will be strong enough to be carried up to four stories, as conditions warrant. It will be connected with the main building by means of concrete covered walks which will permit workmen and watchmen to pass to and fro under shelter and also admit of conveyors to carry raw material into the different departments in the main building.

OSWALD LEVER CO., Philadelphia. This firm is exceptionally busy working upon uncompleted orders for new high-speed skein winders, spoolers and cop frames, and has sent many of these machines to various points in this country and quite a number to England. This work has sprung up in the past month or two, and is in strong contrast with the business of early fall, when there were numerous inquiries but few orders.

WESTERN ELECTRIC COMPANY, New York and Chicago. On January 29, 1909 a sales organization conference of this company, was held in Chicago, in attendance upon which were several of its old employees among whom may be mentioned the following, with date of their entering the employment of the company: E. W. Bennett, 1874; J. C. Cannon, 1877; F. B. Uhrig, now Western district supervisor of the company, located at Kansas City, 1881; D. L. Harmon, a banker at Indiana Harbor, Ind., 1883; C. D. Wilkinson, manager of the Minneapolis house, 1886; Wm. Carpenter, of the Walworth & Neville Mfg. Co., 1887; Rolo C. Hearsley, 1888; and E. S. Holmes now manager of the Indianapolis house, 1890.

MILL NEWS.

Notices of mill projects, additions or improvements are solicited for this department.

ALABAMA.

SLOCUM. A company is being organized here with a capital of $100,000 to build a cotton mill; $40,000 has already been subscribed.

GEORGIA.

ACWORTH. A cotton rope mill and a knitting mill are planned for this place in which the Board of Trade is interested.

ATLANTA. A cotton yarn and hosiery mill is contemplated for this place in which Samuel W. Wilkes is interested. We understand that machinery is wanted.

COLUMBUS. The Hamburger Cotton Mills of this place will build a large addition to their present plant to accommodate 8,000 ring spindles, 224 narrow looms, and fitted for dyeing and finishing.

FORSYTH. The Upson Mfg. Co., Waynmanville, is to build a cotton mill at this place, for the manufacture of yarn, with a capacity of about 3,500 ring spindles, to be operated under the name of Newton-Harp Mfg. Co., with a capital of $30,000. The motive power will be steam but electricity will be installed later. W. H. Newton is the general manager.

GRIFFIN. The Spalding Cotton Mills intend to increase their capacity by the addition of 11,000 ring spindles and 375 looms.

HAWKINSVILLE. It is reported that the Southern Cotton Mills will increase their capacity by 5,000 spindles.

LAGRANGE. The Unity Cotton Mills of this place have awarded contract for the construction of No. 2 mill. Park A. Dallis, of Atlanta, is the mill engineer in charge. $400,000 to $500,000 are to be expended. The additional mill is to be two stories high, brick, 132x290 feet, to be equipped with 10,000 spindles and accompanying machinery. Electric power will be used for operating.

MACON. The Manchester Mfg. Co., has been incorporated with a capital of $100,000 for the manufacture of cotton yarns, with equipment of 12,500 ring spindles, etc. W. A. Crutchfield is president.

SUMMERVILLE. It is reported that subscriptions have been secured to the extent of $150,000 toward the establishment of a print cloth mill in this locality to have a capital of $200,000. The mill will be built of brick or re-inforced concrete and equipped with 10,000 spindles and about 300 looms. E. W. Sturdivant of this place, and Z. T. McKinney, of Greenville, S. C., are interested.

ILLINOIS.

CHICAGO. The Lorenz Knit Goods Mfg. Co., has been incorporated with a capital of $50,000 to manufacture knit goods, etc. Richard Lorenz is one of the incorporators.

LOUISIANA.

BATON ROUGE. It is reported that arrangements have been completed by the Board of Trade of this place for the establishment of a knitting mill.

MAINE.

OLD TOWN. C. C. Garland is interested in the promotion of a cotton mill project for this locality. It is proposed to erect a mill for the manufacture of fine and

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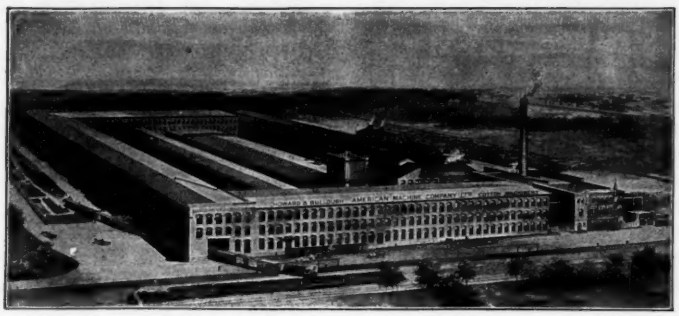
65 Franklin St.

HOWARD & BULLOUGH
American Machine Company, Ltd.
PAWTUCKET, R. I.

Southern Offices
814-816 Empire Bldg.,
Atlanta, Ga.

COTTON MACHINERY



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medium fine cotton goods, with 50,000 spindles and 1,200 looms and to employ 600 hands. About 1,500 to 2,000 horse-power will be needed and there are three sources from which this power can be obtained, in form of electrical energy generated by waterfalls. The proposed capital is $1,000,000.

MASSACHUSETTS.

BOSTON. At a special meeting of the directors of the American Woolen Company, it was unanimously voted to authorize the increase of the worsted production of the company by additions to the Wood Worsted Mills, Lawrence, Mass., and the Fulton Mills, N. Y.

BOSTON. One million dollars worth of stock, it is stated, is to be offered to the public by Eugene N. Foss and his associates to finance the building of the cotton mill that is to be established here under the name of the Reciprocity Mills.

LAWRENCE. The Pacific Mills have acquired a large tract of land for the purpose of erecting a large print works. The lot contains about 16 acres of land.

NEW BEDFORD. The Pierce Mfg. Company expects to build a new brick weave room, 150x165 feet, which will be one story in height and to cost about $50,000.

MARYLAND.

LONACONING. The Klots Throwing Co., have placed an order for additional machinery.

MICHIGAN.

GRAND RAPIDS. The Clark Knitting Co., has been organized with a capital of $25,000 to manufacture men's, women's and children's underwear. It is expected that operations will be begun about March 1. A. Edward Clark is president.

MINNESOTA.

AUSTIN. It is stated that an effort is being made to remove the plant of the Rushford Knitting Mills to this city from Rushford. The mills have been in operation in the latter place for the past twelve years with an annual output of about $50,000.

MINNEAPOLIS. The Northwestern Knitting Company has filed an amendment in the office of the Secretary of State to increase its capital stock from $125,000 to $1,000,000.

MISSISSIPPI.

MERIDIAN. It is said that arrangements have been completed whereby New Orleans manufacturers will build a hosiery mill at this place with a capital of $300,000. Kratcher Threefoot is one of the parties interested.

MISSOURI.

ST. LOUIS. The Ferguson Waterproof Co., has secured a building in this city and installed machinery for a daily output of 10 dozen waterproof coats.

NORTH CAROLINA.

BESSEMER CITY. The Mascot Cotton Mills Co., has been incorporated with a capital of $50,000, for the manufacture of cotton goods. R. C. Ormond is one of the incorporators.

BESSEMER CITY. The Slater Mfg. Co., has been incorporated with a capital of $300,000 for the manufacture of cotton goods, by J. A. Long and others. Caesar Cone, Greensboro, N. C., is one of the directors. The product will be madras and yarns.

CHAPEL HILL. The Blanche Hosiery Mills and the Alberta Cotton Mills have been purchased by Julian S. Carr, Durham, N. C.

CONCORD. The Locke Cotton Mills Co., will rebuild the mill of the Odell Mfg. Co., and install about 50,000 spindles.

CONCORD. The Magnolia Mills Co., will erect a third mill of 2,000 spindles with accompanying machinery for the manufacture of cotton yarn.

CORNELIUS. The Cornelius Cotton Mills are to install a finishing plant.

FLAT ROCK. The Skyland Hosiery Co., intends to build a dyeing and finishing plant with a daily capacity of 2,000 dozen pairs of hose at a cost of $25,000.

HENDERSONVILLE. D. G. Little, Spartanburg, S. C., is interested in a project for the organization of a company in this place to manufacture cotton goods and has offered to subscribe $200,000 towards it if $75,000 be subscribed in Hendersonville. W. A. Smith, chairman of the local committee, is soliciting subscriptions.

KANNAPOLIS. The Cannon Mfg. Co., is to build an extension to its plant for looms for the manufacture of towels, etc.

KINGS MOUNTAIN. The Cora Cotton Mills of this place are quoted as contemplating the addition to their plant of 10,000 spindles.

LAURINBURG. In our last issue we referred to a cotton mill project in which J. P. McRae and others were interested. This project has developed into the incorporation of the Waverly Cotton Mill with a capital of $300,000 to be equipped with 18,000 spindles.

LEAKSVILLE. The McAllister Co., has been incorporated with a capital of $125,000 to manufacture cotton yarns, etc. T. G. McAllister, Fayetteville, is one of the incorporators.

MONROE. The Icemorlee Cotton Mill Co., is to build another mill in this locality to hold 5,000 spindles for manufacturing fine yarns.

MOORESVILLE. The Mooresville Cotton Mills have increased their capital from $200,000 to $400,000.

MOUNT HOLLY. The Woodlawn Mfg. Co., is to erect a new building, one story, 75x100 feet, and will install 5,000 spindles therein for the operation of which there will be required 100 to 125 horse-power electrical equipment.

SALISBURY. The Kesler Mfg. Co., is to build a two-story addition to its plant, 80x120 feet, and will install additional machinery chiefly for spinning.

SMITHFIELD. The Ivanhoe Mfg. Co., has been incorporated with a capital of $300,000 and will build a mill of 5,000 spindle capacity for the manufacture of cotton yarn. B. B. Adams is one of the parties interested.

WADESBORO. The Wadesboro Cotton Mills will add 1,000 spindles and accompanying machinery.

WORTH. The Harden Mfg. Co. has in mind the increasing of its plant by 4,160 spindles. This is the plant that was referred to in our last month's issue as being located at Harden in which O. D. Carpenter & Sons were interested. The location should be Worth instead of Harden.

ZEBULON. The Southern Spinning and Mfg. Co., has been incorporated with a capital of $300,000 for the manufacture of hosiery yarns, etc. 5,000 spindles will be installed to be operated by steam. Archibald Meldrum is the engineer in charge and the president.

NEW YORK.

NEWBURGH. The Newburgh Bleachery is to erect a large addition to its already large plant to be two stories high and 34x129 feet in dimensions, concrete construction, the structure to be well lighted and the machinery of the most modern design.

UTICA. The Progressive Knit Goods Co., has been incorporated with a capital of $25,000. Clarence M. De Water is one of the incorporators.

OKLAHOMA.

POTEAU. W. A. Campbell is interested in a plan to form a company in this locality for the manufacture of cotton goods.

SOUTH CAROLINA.

EASLEY. The Easley Cotton Mill intends to build an addition to accommodate 25,000 spindles and 600 looms at a cost of $500,000. Electric power will be used. J. E. Sirrine, Greenville, is the engineer in charge.

GREENVILLE. The Brandon Mills referred to in our last month's issue has awarded contract and begun construction of an additional mill.

GREENVILLE. The Woodside Cotton Mills are to add 25,000 spindles and 700 looms to their present equipment at a cost of $500,000 for the manufacture of print cloth.

HARTSVILLE. The Hartsville Mills are to install 4,000 additional spindles for the manufacture of print cloth.

INMAN. The Inman Mills are to put up an addition to the present plant to accommodate nearly 20,000 spindles and 500 broad looms for the manufacture of cotton sheeting.

LANDO. The Manetta Mills intend to increase their capital from $200,000 to $300,000.

LEXINGTON. Water power is now being developed at this place in contemplation of the erection of a cotton mill for the manufacture of sheeting to have an equipment of 25,000 spindles and accompanying looms. Perry Hall is interested.

WESTMINSTER. W. E. Cheswell is said to be organizing a company to be located at this place for the manufacture of cotton goods.

WOODRUFF. The Woodruff Cotton Mills are about to build an addition to their present plant for the manufacture of print cloth.

TENNESSEE.

LEBANON. In our last month's issue we referred to the incorporation of the Lebanon Woolen Mills with a capital of $60,000 for the manufacture of woolen blankets. The mills will be of two or three-set capacity and will be operated by electricity, steam or gas.

MEMPHIS. The Southern Cotton Bagging Co., Norfolk, Va., intend, it is reported, to establish a plant here for the manufacture of cotton bagging.

ROCKFORD. The Rockford Cotton Mills were damaged last month by fire at a loss of $25,000. It is said that the plant will be rebuilt.

TEXAS.

AUSTIN. The Legislative committee has reported favorably on a bill to appropriate $100,000 for the establishment of a bagging, sack and twine mill at the State Penitentiary. Information can be obtained by addressing Gov. Thos. M. Campbell.

DENISON. The Denison Cotton Mill Company has ordered 96 looms additional to its present equipment.

FORT WORTH. We referred in our last month's issue to the negotiations being carried on by the Factory Club with parties in North Carolina, and elsewhere, relative to the location of a cotton mill in this place. The promoters are experienced cotton mill men in North Carolina, South Carolina and Maine, and propose organizing a corporation under